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AUTHORIZING APPROPRIATIONS TO THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MARCH 3, 1960.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. BROOKS of Louisiana, from the Committee on Science and Astronautics, submitted the following

REPORT

[To accompany H.R. 10809]

The Committee on Science and Astronautics, to whom was referred the bill (H.R. 10809) to authorize appropriations to the National Aeronautics and Space Administration for salaries and expenses, research and development, construction and equipment, and for other purposes, having considered the same, report favorably thereon without amendment and recommend that the bill do pass.

PURPOSE OF THE BILL

The purpose of the bill is to authorize appropriations to the National Aeronautics and Space Administration for fiscal year 1961, totaling $915 million.

The authorizations, in terms of three NASA appropriations, are as follows:

Salaries and expenses	$170, 760, 000
Research and development	621, 453, 000
Construction and equipment	122, 787, 000

EXPLANATION OF THE BILL

SALARIES AND EXPENSES

The $170,760,000 allocated to "Salaries and expenses" includes $128,625,000 for wages and salaries. Expenses for other items such as travel, rents, utilities, and retirement contributions amount to $42,135,000. The total number of permanent positions is expected to increase from 10,086 to 16,373.

Most of the proposed increase reflects the transfer to NASA of the Huntsville facility (now the Development Operations Division of the Army Ballistic Missile Agency). This transfer will include 1,200 supporting personnel as well as the 4,300 scientific and technical positions which will be transferred to NASA intact. Salaries and expenses for "NASA Huntsville" would increase from $227,000 in fiscal year 1960 to $58,313,000 in fiscal year 1961. The latter figure includes all salaries and expenses resulting from the acceleration of the Saturn project.

The transfer of the Huntsville facility from the Army to NASA will not raise Government costs as a whole, since the resulting increase will appear not only as an addition to the NASA budget but as a deduction from the Army budget.

In order to raise the pay scale of the Huntsville facility to the level of NASA as a whole, it will be necessary to establish 27 additional excepted positions for which the Administrator may fix the compensation up to a limit of $19,000 a year. Three additional positions paid up to $21,000 a year are also requested; at least one of these will be allocated to the Huntsville facility. No increase in NASA appropriations for fiscal year 1961 will be involved. This request has been approved by the Bureau of the Budget.

Under section 203(b)(2) of the National Aeronautics and Space Act of 1958, NASA was given 10 positions paid up to $21,000 a year and 250 positions paid up to $19,000 a year. It has already established or committed 218 of the excepted positions authorized by the act. Of these, 82 are used at headquarters; except for 9 managerial positions, all are filled with personnel who head professional and technical programs. An additional 136 excepted positions are allocated to the NASA research centers in the field.

At the principal NASA research centers, the average proportion of excepted positions to the total number of research scientists and engineers is approximately 3.8 percent. After planned increases have been made, the percentage at the NASA research centers will rise to 3.9. The proportion at the Huntsville facility, however, is only 1.8 percent, based on 18 supergrade and excepted positions which will be transferred to NASA. The committee is informed that, if the 30 additional requested positions are authorized, 36 new excepted positions will be established at NASA Huntsville. This addition will raise the proportion there to 4 percent.

Dr. Wernher von Braun, the Director of the Huntsville facility, has expressed his approval of the NASA proposal, as follows:

> A total of 54 positions will help considerably to remedy a situation where we now have only 18 and we understand that this number (54) is sufficient to bring the proportion of such jobs at Huntsville at least on a par with the other NASA centers.

One of the three additional requested positions in the pay range of $19,000 to $21,000 will be filled with the Director of NASA Huntsville (Dr. Wernher von Braun). Another will be held for the Director of the Office of Launch Vehicle Programs. This position is now occupied by an Air Force major general on reimbursable detail. The third $21,000 position will be held in reserve for future assignment.

The following tables show the present geographical distribution of excepted NASA positions and their ratio to the total numbers of scientists and engineers:

ATTACHMENT A

NASA excepted positions, Feb. 23, 1960—distribution, by location

Rate	Langley	Ames	Lewis	Goddard	Flight Research	Huntsville	Western Office	AMROO	Wallops	Total field	Total headquarters	Total NASA
$21,000										0	4	4
$20,000	1	1	1	1						4	1	5
$19,000	2	1	1	1						5	19	24
$18,500	1	2	2	2						7	0	7
$18,000	2		2		1	1				6	0	6
$17,500	2	4		2			1	1		10	2	12
$17,000	2		2		1					5	3	8
$16,500	2		3	3	1					9	13	22
$16,000	5	3	2	6	1	1				17	8	25
$15,500	13	8	6	1	1	1		1		31	9	40
$15,000	7	2	10	4	4				1	29	20	49
$14,500				4						4	3	7
$14,000				9						9	0	9
Total	37	21	29	33	9	3	1	2	1	136	82	218

ATTACHMENT B

Ratio of NASA excepted positions to total professional strength (engineers and scientists)

Based on the total number of research professionals in the principal field centers, the ratios of excepted positions are as follows:

	Total research professionals	Excepted	Percent	Proposed field distribution of 30 additional positions		
				Excepted additional	Total	Percent
Langley	1,155	37	3.2	1	38	3.3
Ames	447	21	4.7		21	4.7
Lewis	937	29	3.1	2	31	3.3
Goddard [1]	616	34	5.5	1	35	
Subtotal, other centers	3,155	121	3.8	4	125	
Huntsville:						
Supergrades [2]	1,350	18	1.3			
Excepted [3]		20	1.5			
Total		38	2.8	16	54	4.0

[1] Although the ratio for Goddard shows as higher than the others, Goddard has been staffed "at the top" with key leadership during the past year. The research staff is expected to increase to around 890 in fiscal year 1961. On this 890 figure, Goddard's ratio will be 4.3 percent.

[2] The 18 current positions at Huntsville are 12 Public Law 313's, 565 GS-17, and 165 GS-18 supergrades allocated for the Department of Defense. These will be transferred under the President's plan to NASA and become a permanent addition to the NASA staffing ceilings.

[3] 3 positions are now allocated. NASA is in the process of allocating 17 additional positions, or a total of 20 within the existing authority of NASA for 260 excepted positions.

Because of increased workload, additional personnel are also requested for the Wallops Island station and the Goddard Space Flight Center. Anticipated requirements would add 75 employees at Wallops and 786 at Goddard. During the next fiscal year, the Wallops Island station will be called upon to launch, track, telemeter, and recover a substantially greater number of satellites and probes. The Goddard Center is a new laboratory at Beltsville, Md., which

will begin to carry out its assigned programs of earth satellites, sounding rockets and manned space flight during this fiscal year.

The level of operations at other activities operated by NASA will be substantially the same in fiscal year 1961 as in the previous fiscal year.

The following table sets forth anticipated salaries and expenses at each NASA installation:

Salaries and expenses, fiscal year 1961

Installation	Salaries	Expenses	Total
NASA headquarters	$6, 200, 000	$3, 690, 000	$9, 890, 000
Langley Center	22, 609, 000	6, 686, 000	29, 295, 000
Ames Center	10, 650, 000	4, 594, 000	15, 244, 000
Lewis Center	20, 101, 000	5, 623, 000	25, 724, 000
Flight center	3, 120, 000	559, 000	3, 679, 000
Goddard Center	15, 834, 000	9, 250, 000	25, 084, 000
Wallops station	1, 915, 000	763, 000	2, 678, 000
NASA Huntsville	47, 540, 000	10, 773, 000	58, 313, 000
Western office	393, 000	122, 500	515, 500
AMRO office	226, 000	52, 000	278, 000
PMRO office	37, 000	22, 500	59, 500
Total	128, 625, 000	42, 135, 000	170, 760, 000

RESEARCH AND DEVELOPMENT

The following is a table of the research and development programs of the National Aeronautics and Space Administration for fiscal year 1961.

Research and development programs, fiscal year 1961 estimates

Program	*Fiscal year 1961*
A. Aeronautical and space research:	
Support of NASA plant	$51, 345, 000
Research grants and contracts	10, 000, 000
B. Scientific investigations in space:	
Sounding rockets	8, 000, 000
Scientific satellites	41, 700, 000
Lunar and planetary exploration	45, 000, 000
Vanguard	----------
C. Satellite applications:	
Meteorology	20, 700, 000
Communications	5, 600, 000
D. Manned space flight	107, 750, 000
E. Vehicle systems technology	21, 200, 000
F. Space propulsion technology:	
Solid rockets	2, 800, 000
Liquid rockets	63, 000, 000
Nuclear systems technology	10, 000, 000
Space power technology	8, 000, 000
G. Vehicle development:	
Delta	12, 500, 000
Centaur	47, 000, 000
Saturn	134, 308, 000
H. Tracking and data acquisition	32, 550, 000
Total	621, 453, 000

A. AERONAUTICAL AND SPACE RESEARCH

1. Support of NASA plant, $51,345,000

This money is to provide funds for certain transportation expenses, leased communication lines, contractual services, repairs, alterations, minor construction, supplies, materials, and equipment required in the operation of all NASA installations. The major funding increases reflected in the estimates for 1961 are due primarily to the following factors:

(*a*) Transfer of the Development Operations Division of the Army Ballistic Missile Agency, Huntsville, Ala., to the NASA.

(*b*) The expensive and increasingly complex nature of experimental research in general and on space programs in particular.

(*c*) High initial tool-up costs for accelerated attack on advanced research areas (materials, electrical power generation, hypersonic aerodynamics and control, guidance and navigation).

(*d*) The addition of a number of major new facilities involving high operating costs (the Lewis Plum Brook research facilities, the Ames 3.5-foot hypersonic tunnel, and the Langley 7-foot thermal structures tunnel).

(*e*) The large backlog of necessary repair, alteration, and facility modernization projects.

(*f*) The increasing rate of obsolescence on research equipment and instrumentation.

(*g*) The substantial increase in the anticipated number of research vehicle firings.

A breakdown of this expense follows:

Research and development

Analysis by location:	*Fiscal year 1961*
NASA headquarters	$2,025,000
Langley Center	9,100,000
Ames Center	4,070,000
Lewis Center	9,180,000
Flight center	1,050,000
Goddard Center	6,068,000
Wallops station	1,052,000
NASA Huntsville	18,752,000
Western office	35,000
AMRO office	8,000
PMRO office	5,000
Total	51,345,000

2. Research grants and contracts, $10 million

This money is required to utilize most effectively the nongovernmental research talent and facilities of the Nation for the conduct of fundamental and applied research necessary for advancing aeronautical and space technology.

In order to keep pace with the Nation's growing space program it is necessary that an increase in funds be made available to permit the NASA to utilize, through the medium of research grants or contracts, the services of the scientific personnel of the Nation's universities and other nongovernmental research establishments. It is only through this mechanism that the services of some of the Nation's most eminent scientists may be utilized to assist in the solution of existing urgent problems in aeronautical and space technology, and to conduct the

long-range fundamental research investigations that provide the knowledge upon which future programs may be based. This procedure also permits the Government to utilize unique facilities that exist outside its own laboratories for the solution of urgent problems.

Particular attention must be given not only to encouraging work by existing groups but also to aiding in the establishment of new centers in the Nation's universities for research in the space sciences.

Shortly after the establishment of the NASA, a program of long-term support was initiated in the universities by means of research grants. Where appropriate, research-type contracts were developed for utilization in the support of research that was applied in nature. The continuation and expansion of these programs during the fiscal year 1960 has shown that the NASA has developed the facility for handling this type of program with a high degree of satisfaction to the universities and research centers involved and in a manner that promotes the best interests of the Government.

To keep pace with the growing needs of the Nation's space programs, $10 million is required for the fiscal year 1961, as follows:

Physical sciences.—Research is required on numerous problems in the areas of physics, chemistry, and mathematics. The investigation of the physics and chemistry of solids is of the first order of importance in the search for improved materials. Of equal importance is the investigation of the physical and chemical phenomena of high-temperature gases. At the speeds and densities encountered in space operations, the gases are subjected to a number of relatively unexplained phenomena such as dissociation and ionization. These and many other similar problems in the physical sciences should be extensively explored.

Cosmological sciences.—The inaccessibility of space prior to the launching of satellites and space probes requires that investigations in the planetary sciences (astrophysics and astronomy) be accelerated. These are areas of great importance about which comparatively little is known. Although major efforts in these fields will be carried on by the space flight development programs of the NASA, there are numerous problem areas involving cosmic rays, planetary mapping by radar techniques, and trajectory calculations, to which the universities, the traditional centers of fundamental research in the Nation, are in a position to make important contributions.

Bioscience.—During the fiscal year 1960 an intensive study of the NASA's role in the biosciences is being undertaken. The problems confronting man in traveling through space are becoming well known and the first steps of the NASA to cope with this important problem area have been initiated. There are numerous problems in biophysics, bioengineering, metabolism, behavior, and space environment. The attention of the Nation's biomedical scientists can be directed toward these problems through support of their work by research grants.

Engineering sciences.—Engineering research in the field of energetics, electromagnetics, fluid mechanics, materials technology, mechanics, systems analysis and control, and flight operations is required to bring about urgently needed improvements in both the performance and the efficiency of the extremely complex systems required for space flight. For example, in the field of energetics, it is important that an increased effort be devoted to research on new means of energy conversion and utilization from nuclear or solar sources, or possibly from matter in space, if certain of the required space missions are to be performed.

Socioeconomic studies.—Man's exploration of space poses many social and economic problems that require study. The exploration of these problems is necessary to permit sound policy determinations to be made in future space age planning.

Miscellaneous.—The NASA research associateship program administered by the National Academy of Sciences and the advice and counsel provided by the Space Science Board of the National Academy of Sciences are invaluable adjuncts to the NASA's space effort.

B. SCIENTIFIC INVESTIGATIONS IN SPACE

1. Sounding rockets, $8 million

This money is required to determine and understand the composition, structure, spatial distribution, dynamical behavior, and equilibria of the earth's atmosphere; to investigate the interactions of incident electromagnetic and particle radiations with the earth's atmosphere, including solar-terrestrial relationships; to determine and understand the relations between the earth's upper atmosphere and its surface meteorology; and to carry out exploratory geophysical and astrophysical investigations leading to later satellite and deep space probe experiments.

A sounding rocket is a rocket used to carry a scientific payload to a height of up to one earth's radius, i.e. about 4,000 miles. The sounding rocket affords a means of investigating the earth's atmosphere in vertical cross section out to the distance at which the atmosphere merges with the medium of interplanetary space. Both exploratory and routine experimental programs are possible with relatively simple tracking ranges and launching sites. Many investigations of atmospheric structure, composition, ionization, motions, aurora, airglow, absorption of solar radiation, and interactions with cosmic rays and other particles can best be conducted by means of sounding rockets, particularly at altitudes below those at which satellites can remain in orbit. Moreover many sounding rockets are easily and quickly launched from shipboard or other special sites on short notice for the investigation of sporadic phenomena such as the aurora, magnetic storms, and solar flares. The sounding rocket also provides a means of testing under actual operating conditions equipment intended for later use in satellites or deep space probes, thus providing a check on the equipment before it is committed to the much more expensive vehicles. The current NASA program is based on experience gained from 13 years of rocket soundings, and is a program designed to extend and to fill in the gaps in the knowledge so far acquired on the earth's upper atmosphere and in rocket astronomy.

Operationally, the NASA rocket sounding program divides into three parts: (*a*) Low altitude soundings up to 100 kilometers (60 miles), (*b*) medium altitude soundings reaching to 400 kilometers (250 miles), and (*c*) high altitude soundings above 400 kilometers, extending to one or several thousands of miles. Part (*a*) is directed toward completing our knowledge of the lower atmosphere, and includes detailed measurements and synoptic studies of geographical and temporal variations in atmospheric properties, with particular interest in relations of the higher atmosphere to surface meteorology. Part (*b*) involves the study of the high atmosphere, with particular emphasis on the ionosphere and solar-terrestrial relationships. This portion of

the program also includes rocket astronomy. Part (*c*) involves the study of the outer portions of the earth's atmosphere and the fringe regions where the atmosphere merges into interplanetary space. Work in this portion of the program is still in its beginning stages, and measurements in the immediate future will be of an exploratory and survey nature, laying the groundwork for more detailed and precise observations later on.

In the fiscal year 1959 a large part of the work was devoted to the analysis of data obtained during the International Geophysical Year. In addition, work was started on the development and preparation of advanced instrumentation for continuing the rocket sounding program. Examples of this instrumentation include the development of a new type of magnetometer and the development of new types of mass spectrometers, pressure gages, and ionospheric instrumentation. During this fiscal year about 35 sounding rockets of the low and medium altitude types were procured for the sounding rocket program. Both low altitude and medium altitude soundings were conducted.

During the fiscal year 1960 the analysis of data obtained from sounding rocket flights is continuing. The medium altitude sounding program is being greatly strengthened and the rate of soundings increased. The development of advanced instrumentation begun in the fiscal year 1959 is continuing. About 75 sounding rockets are being procured and their payloads funded. Most of these are of the fiscal year 1960 altitude range, but some high altitude rockets are included. By the end of the fiscal year 1960 the rate of rocket soundings will attain a level of about 90 rockets per year. A beginning is being made in the performance of outer atmosphere experiments, using such vehicles as the Jason and Javelin rockets.

The funds requested for the fiscal year 1961 will permit the continuation of the rocket-sounding program at the level of about 90 rockets per year, including purchase of the necessary rockets, preparation of the payloads, and analysis of the results. Development of advanced instrumentation will continue. In addition to continuing the low and medium altitude work vigorously with about 70 rockets, the high altitude soundings will be stepped up, with particular emphasis on the outermost portions of the ionosphere, interactions between the ionosphere and the radiation belt, studies of the auroras, and studies of the earth's magnetic field.

2. Scientific satellites, $41,700,000

This money is required to determine the nature, extent, and dynamical behavior of the earth's outer atmosphere, and its relation to the medium of interplanetary space; to determine and understand the nature, extent, dynamical behavior, and causes of the earth's ionosphere; to understand the nature, extent, and temporal variations in the gravitational, magnetic, and electric fields in the vicinity of the earth; to understand the origin, nature, motions, spatial distributions, and temporal variations of particles reaching the vicinity of the earth and having energies appreciably greater than thermal; to investigate the electromagnetic radiations in all wavelengths, from gamma rays to radio waves, that reach the vicinity of the earth from the planets, sun, stars, galaxies, and interstellar and intergalactic matter, and to use these observations to extend our knowledge of these bodies; to

determine and understand the interrelationships among the above-listed phenomena; to determine and understand the environmental conditions encountered in the upper atmosphere and in interplanetary space, and the effects on vehicles traversing these regions, including effects on materials, equipment, and living organisms; and to determine and understand possible departures from the laws of classical physics which may be demonstrated under conditions of satellite flight.

The projects under this program support the above objectives by providing for the continuation of a series of exploratory measurements followed by more advanced experiments. The exploratory measurements in new areas are intended to give order-of-magnitude estimates of the quantities under investigation and to probe for new discoveries. The advanced experiments are designed to make accurate measurements within the ranges indicated by the earlier investigations. The knowledge to be gained will lead to a better understanding of the earth and man's environment and consequently to a better use of the environment to man's benefit. In this connection, it must be recalled that the surface meteorology of the earth, the propagation characteristics of radio waves, the auroras, the radiation belts, and other geophysical phenomena are closely related to the sun and the interactions of the sun and the earth. The proper investigation of these interrelations requires observations and measurements at the outermost portions of the earth's atmosphere, for which the artificial earth satellite provides an indispensable and highly effective tool.

In the fiscal year 1959 the analysis of results obtained from Explorer and Vanguard satellites was continued. A Vanguard satellite designed to furnish cloud cover information was placed in orbit. The development of advanced instrumentation for the measurement of cosmic rays, the application of accurate clocks to relativity experiments, radiobeacons, electron density Langmuir probes, and for the measurement of solar ultraviolet radiation was initiated. Funding was initiated for the purchase of seven Juno II vehicles and one Thor-Able to be used in the launching of satellites. The construction and testing of payloads for these vehicles was initiated.

The analysis of earlier satellite results is continuing in the fiscal year 1960. Development of instrumentation is being undertaken for the measurement of atmospheric pressures, densities, temperatures, composition, and winds; and work is continuing on the Langmuir probe instruments and on the development of special satellite magnetometers. Funding is being largely completed during the fiscal year 1960 for the Juno II vehicles and the one Thor-Able vehicle for which procurement was started in 1959. The preparation of payloads for these vehicles for launching in the fiscal year 1960 and early in the fiscal year 1961 is continuing along with the preparation of the payloads for the scientific satellites to be launched by Delta vehicles the last half of the fiscal year 1961 and the first half of the fiscal year 1962. The Thor-Able satellite Explorer VI, the Vanguard III satellite, and the Juno II satellite Explorer VII were launched and have already yielded valuable scientific results on the Van Allen radiation belt, the magnetic field of the earth, cosmic rays, micrometeorites, and solar-terrestrial phenomena, and, in addition, an elementary one-line television scanner was checked out.

Fiscal year 1961 funds will be used to initiate the funding and procurement of two Atlas-Agena B and two Thor-Agena B vehicles and their payloads, and to procure seven Scout vehicles and four payloads. Three of the Scout vehicles are for the international program. The Thor-Able, Juno II, and Delta vehicles which have been used to this time are being replaced in the programing by the newer and more powerful Atlas-Agena B and Thor-Agena B vehicles. The Atlas-Agena B will be capable of launching satellites into very high altitude elliptical orbits and of launching heavier satellites into low altitude circular orbits. The Thor-Agena B will be used to launch lighter satellites into low and medium altitude orbits. The Scout is a versatile, solid propellant rocket capable of placing 200 pounds into a 300-mile orbit. The higher payload capacity of these vehicles makes it possible to install more scientific instrumentation in each payload for making more measurements simultaneously, thus increasing the value of each set of data.

The experiments planned for the fiscal year 1961 will provide information on atmospheric and ionospheric composition; atmospheric structure and dynamics; ionospheric structure and dynamics; the radiation belt and its associated magnetic field; the earth's magnetic field; and on meteoroid and other environmental factors affecting materials. An Atlas-Agena will be used to launch the orbiting astronomical observatory satellite into a circular orbit of about 500 miles altitude. This satellite will be stabilized in inertial coordinates and will be instrumented to perform astronomical observations not possible on the earth due to the interference presented by the earth's atmosphere. Another Atlas-Agena will be used to launch the orbiting geophysical observatory satellite into a highly elliptical polar orbit extending as far as 60,000 miles from the earth. This satellite will be instrumented with radiation counters, magnetic field instruments, and various detectors and equipment designed to obtain a description of the earth's atmosphere and environment from pole to pole and from a few hundred to 60,000 miles in space.

One Thor-Agena will be used to launch a solar geophysical satellite equipped with a pointing control and instruments for studying solar phenomena, and instruments for making terrestrial observations simultaneously. A Thor-Agena will also be used to launch the polar geophysical satellite into a low altitude circular polar orbit. This satellite will be instrumented for the determination and comparison of atmospheric and ionospheric structure, properties and composition, and for measurements of energetic particles and the magnetic field of the earth from equatorial to polar regions.

One Scout and its payload will be devoted to a detailed study of the radiation belt especially with respect to biological implications. Another Scout payload will be a satellite launched into a 300-mile polar orbit for studies of the interactions and interrelationships of the earth's atmosphere, magnetic field, and the energetic particles of cosmic rays, the radiation belt, and auroras. Other Scout payloads will probe the atmosphere and ionosphere to distances of 6,000 miles in studies of atmospheric composition and structure, and ionospheric charged particles distributions.

It should be pointed out in connection with program phasing that the purchase of vehicles and the initiation of preparation of payloads are both long leadtime items. Thus, vehicles purchased in one year

are fired 1 or 2 years from the date of purchase. Similarly, the payloads for these vehicles must be started 1 or 2 years in advance of the actual launching.

3. Lunar and planetary exploration, $45,000,000

This money is needed to acquire fundamental physical and chemical information on the moon and planets; to investigate space phenomena and their variations over the range of lunar and interplanetary distances; to explore the surface and nearby environment of the moon and to measure and describe in detail its characteristics, for example, the surface composition, radioactivity and structural features, and the magnetic and gravitational fields; to investigate the constituents, processes, and characteristics of the interplanetary regions so as to understand how and why they vary with time and location within the solar system; to extend these investigations to the detailed study and exploration of the planets; to develop improved means and techniques for the conduct of lunar, interplanetary and planetary investigations and explorations.

As our nearest major body in the solar system, basically unchanged for billions of years, the moon itself offers unique potentialities for better understanding of historic and contemporary phenomena of the solar system and for clarification of basic physical, chemical, and biological concepts that are fundamental to modern science. It can be hoped that the moon will provide the first answers that will unlock the secrets of the origin and evolution of the solar system. Until now, progress along these lines has been subject to the limitations imposed by remote observations and indirect measurements. The understanding which can be gained from direct measurements and observations will be far greater. Space flight vehicles now offer research capabilities for overcoming many of these limitations.

In particular, it will be possible to utilize appropriate instrumentation to determine by direct measurement, lunar, planetary, and interplanetary characteristics, and thus provide a wealth of fundamental information on the nature, magnitude, distribution, and variations of the electromagnetic radiations, energetic particles, electric and magnetic fields, cosmic dust particles, lunar, planetary, and solar atmospheres which are continuously interacting within the solar system. These interactions are already known to markedly influence the earth's atmosphere and fields, and a knowledge of their mechanisms will clarify our understanding of terrestrial phenomena.

The advancement of scientific knowledge obtained from early lunar explorations and space probes and the experience that will be gained from the operation of space flight systems hundreds of thousands of miles from earth, will provide the basis for the appropriate design of instrumented spacecraft which will eventually explore the planets and deep space.

During the fiscal year 1959, lunar and cislunar space probes permitted evaluation of initial problems associated with the placing of vehicles into lunar trajectories and provided preliminary information on environmental characteristics of cislunar space. Work was initiated on advanced instrumentation and measurement techniques, including, for example, a lunar seismograph system, a plasma probe, a magnetometer to be used in lunar probe flights, and instruments for measuring lunar radioactivity. Pioneer IV, which was initiated by

ARPA and transferred to NASA; was placed in permanent orbit around the sun. The instrumentation in Pioneer IV furnished valuable new data on the radiation belt and its extent into space, showing for one thing that the outermost portions of the radiation belt vary quite markedly with activity in the sun. Funding was initiated for an Atlas-Able vehicle to be used in placing a scientific payload in orbit about the moon, and a Thor-Able vehicle to launch a deep space probe. Development, construction, and testing of payloads for both lunar and deep space probe missions were initiated.

Work is being started during the fiscal year 1960 on the development of instrumentation and vehicle systems with improved capabilities for investigating cislunar space and beyond. The development of advanced instrumentation started in the fiscal 1959 is continuing. A lunar orbiter payload was designed and constructed for the Atlas-Able vehicle for which funding was started in the fiscal year 1959. A preflight failure of the vehicle made it necessary to provide a second booster system. This launch attempt was unsuccessful. Additional lunar orbiters and probes are planned for launching in the fiscal year 1960 and in the fiscal year 1961. Work will also be started on planetary probe payloads. The Thor-Able vehicle funded in the fiscal year 1959 is being used to launch a deep space probe; its payload has been completed during the fiscal year 1960.

The funds requested under this program for the fiscal year 1961 will provide for the design and development of measurement techniques, scientific instruments, and spacecraft for use in lunar and planetary investigations. Work will continue on the construction and testing of advanced systems to observe, study, explore, and investigate the lunar environment, surface, and interior. Studies and preliminary research and development projects will be extended in the fiscal year 1961 to acquire needed technology for spacecraft with a capability for precise circumlunar orbits and instrumented soft landings. Terminal orientation devices and landing controls and propulsion units for spacecraft will be investigated. Design and construction of prototype instrumentation will be initiated for a lunar seismograph and gravimeter system, advanced penetrometers, thermistor probes, and fluorescence spectroscopes.

Beginning in the fiscal year 1961 the Atlas-Agena will be utilized for launching of lunar probe spacecraft. Construction and environmental testing will start on payloads for lunar impact missions with the objective of providing knowledge necessary for the proper design of soft lunar landing vehicles. These payloads will be instrumented to transmit data on the surface characteristics of the moon.

Typical projects included in the advanced development program for lunar, planetary, and interplanetary instrumentation will be: studies of infrared sensors and penetrometers for the investigation of lunar and planetary surface structures; improvement of plasma probes, Geiger and scintillation counters for measurements of the interplanetary medium; improvement of magnetometers to be used in particle flux-magnetic field correlations; beta and gamma ray detectors and spectral analyzers for studies of lunar surface radioactivity; and improvements of television-type image transmission equipment for lunar studies.

An interplanetary space probe will be launched during the fiscal year 1961 by means of a Delta vehicle funded under the Delta develop-

ment program. Design and development effort on the payloads for use in an initial pair of planetary probes will be carried forward with the expectation that Atlas-Agenas will be used as booster vehicles.

C. SATELLITE APPLICATIONS

1. Meteorology, $20,700,000

This money is needed to establish a meteorological satellite capability for worldwide coverage and for providing observations of atmospheric elements required by the meteorologist in order to understand atmospheric processes and predict the weather. These elements include cloud cover, storm location, precipitation, temperature, wind direction, heat balance, water vapor and other constituents. To achieve this objective will require: (*a*) the development of stabilized satellites for polar orbits of 500- to 1,000-mile altitudes and "stationary" satellites for equatorial orbits of 22,000-mile altitudes; (*b*) the development of suitable onboard detection equipment, including television, infrared detectors, radar and spectroscope; and (*c*) the development of adequate data storage, handling and communications equipment and techniques.

The long-range objective is to develop the principles of a system of instrumented orbiting satellites and communications network by means of which worldwide meteorological information may be transmitted to the National Meteorological Center of the Weather Bureau for its operational use.

The earth satellite represents a new observational tool which promises to be of great value to the science of meteorology and to the practice of weather forecasting. Although it would be a mistake to imply that such a device will eliminate our meteorological limitations, there is no doubt that it will supply a tremendous amount of useful meteorological data not now obtainable. It will do this not only because of its ability to give worldwide coverage to some meteorological parameters, in contrast to the current 5 to 10 percent coverage, but also because of its unique vantage point above the atmosphere which will make new measurements possible. Improved basic scientific understanding of atmospheric processes and a more comprehensive knowledge of world and regional climatology will result and these should assist in producing advances in weather forecasting and in approaches to weather modification and control.

The benefits to be derived from these improved capabilities in meteorology include convenience in planning personal activities, protection of life and property from weather disasters; safeguarding transportation; crop planning, control and protection; industrial planning of weather-dependent products, outdoor enterprises, and heating and cooling loads; eventual limited weather modification and control; and good will in return for providing current global meteorological data to other nations. In addition, the same meteorological data required for worldwide civilian needs can, by proper handling, be made to meet special military needs as well.

Project Tiros was initiated by ARPA and transferred to NASA in April 1959. In addition to the support provided by ARPA in payload and booster development, NASA purchased the following items with fiscal year 1959 funds: (*a*) radiation detection equipment and associated ground equipment for a meteorological satellite (Tiros) to be

launched once during the fiscal year 1960 and again during the fiscal year 1961; and (*b*) tracking, telemetering, data processing, and data analysis equipment and services for the satellites.

The fiscal year 1960 funds provide for the continuance of this program at an accelerated rate with strong emphasis on the development of equipment for a series of stabilized follow-on meteorological satellites. These include a radar feasibility study, the development of an electrostatic tape recorder, the development of a vidicon camera, optics and controls, radiation scanning heads, low resolution heat budget instrumentation, attitude control development, spectroscope development studies, the development of recorders, programers, transmitter controls and receivers for the satellite. A substantial effort in basic meteorological research for the utilization of meteorological satellite data is also being conducted. Studies using data from rocket probes, aircraft reconnaissance, and the current meteorological observation sources simulate the kind of information that will be available from satellites and develop techniques to be applied to the analysis of actual satellite data from Tiros. In the fiscal year 1960 Tiros I (containing TV to map cloud cover) will be launched.

The fiscal year 1961 funds have been programed (*a*) to maintain basic research at approximately the same level; (*b*) to allow for some increased activity in the development of advanced instrumentation (specifically in the development of stabilized vehicle control systems, and in the further development of IR detectors, TV systems, radar, and spectroscope; (*c*) to launch Tiros II (containing both TV and IR sensing instruments); (*d*) to allow for increased activity in the analysis of data acquired from the meteorological satellites (Tiros I and II); and (*e*) to initiate payload development, booster vehicle purchase and launch of the follow-on meteorological satellite.

2. Communications, $5,600,000

This money is requested to develop communications satellites and operating techniques for use in a worldwide communications system using satellites as relay stations for ground-to-ground, ground-to-satellite, and satellite-to-ground transmission of messages, data, voice, and television; to develop communications systems for the transmission of scientific data from deep space probes to earth and of commands from earth to deep space probes; and to conduct studies of the application of active relay satellites to civilian and commercial communications.

Long-range communications in the form of telephone, telegraph, and television networks are now accomplished by means of land lines, cables, long- and short-wave radio, and microwave relay stations. The total bandwidth of land lines, cables, and low-frequency radio is limited. Short-wave radio bands are crowded and are unreliable because of atmosphere interference and ionospheric irregularity. Ultra-short-wave or microwave radio is usually limited to line-of-sight range; long-distance communication at these frequencies is commonly achieved by means of repeater stations.

Satellites offer the possibility of worldwide communications by ultra-short-wave or microwave radio because the line-of-sight range at satellite altitudes is very large. The bandwidth or channel capabilities at these wavelengths is sufficient for television and most other foreseeable communications needs.

The scientific exploration of outer space is accomplished by the use of deep space probes. The data these probes accumulate must be transmitted to earth, and the earth stations must be able to send commands to the probes at various points along their paths. This requires a two-way communications link between the earth and the probe.

During the fiscal year 1959, work was initiated on Project Echo—a project to place several 100-foot diameter inflatable spheres into circular orbits about the earth. These spheres will be used to reflect passively electromagnetic energy from one ground station to another. Part of the project is the development of the sphere itself, its packaging into a payload, and methods of inflating and ejecting the sphere from the final booster stage. A 12-foot diameter version of this sphere, which was also to furnish data for air density studies, was launched in August 1959 but failed to achieve orbital velocity. The development of a beacon to aid in the tracking of the satellites was started in the fiscal year 1959. Improvements were also made to the JPL Goldstone transmitter and receiving sites at the Jet Propulsion Laboratory.

In the fiscal year 1960, the large-sphere flight research program will be initiated. Several 100-foot diameter inflatable sphere payloads will be ejected from boosters in vertical suborbital shots to test ejection and inflation techniques. Following this, a 100-foot sphere will be launched to orbit. Communications experiments will be conducted between east and west coast transmitting and receiving stations, using the sphere as a passive relay.

Research and development will be conducted in the fiscal year 1960 in several areas. In the area of inflatable structures for use as passive reflector satellites, work will be done on radio propagation characteristics, the feasibility and development of larger structures, and on rigidization techniques. Studies will be undertaken in the field of world communications needs, of communications satellite system requirements to fulfill these needs, and of the ground support systems required for their use. These studies will be directed toward providing recommendations for the optimum communications satellite system.

The fiscal year 1961 program is a continuation and broadening of the 1960 program. Additional 100-foot spheres will be launched for further communications experiments. Since a worldwide passive satellite communications system will require several satellites simultaneously in orbit, the development of a multisphere payload for launch by a single vehicle will be started. One of these will be launched in 1962. Data transmission requirements will be studied, with emphasis on a data relay for meteorological satellites. The advanced equipment development program will result in prototype models of a high-gain antenna and mount. Development of suitable modulation systems will be initiated.

During the fiscal years 1960 and 1961, work on active relay satellites will be limited to studies on the civilian and commercial applications of these satellites, the requirements imposed by commercial needs on such satellites, and the application of pertinent developments resulting from the Department of Defense program.

During the fiscal year 1959, work in the area of deep space communications was carried out by the Jet Propulsion Laboratory as part of its Juno II program. Their work included the design of a

space vehicle communications and tracking system for the Pioneer III and IV experiments and the evaluation and improvement of elements of existing systems.

In the fiscal year 1960, studies will be made to determine the requirements for deep space communications, and the development of new components will be continued. Fiscal year 1961 will continue studies and component development, and will provide for communications equipment for use in planned deep space experiments.

D. MANNED SPACE FLIGHT, $107,750,000

This money is necessary in order to provide a capability for accomplishing advanced space flight missions with vehicles where onboard human intelligence and operations are required; to rationalize and refine the technology of manned space flight vehicles and associated systems; to achieve successful orbital flight and the recovery of a manned satellite with an ICBM booster and drag-reentry system; to evaluate the physiological and psychological effects of a space environment on man; to establish his capabilities and limitations for performing useful missions in space; and to devise and develop improved manned vehicles with increased capabilities for performing important advanced missions.

The ultimate benefits that might accrue from manned space flight are, in a large measure, unknown. It is clear, however, that instrumentation alone will not tell us as much about the moon, or the planets, as man himself will be able to report once he has visited those distant places. Man contributes observational, analytical, and decision-making ability concerning both expected and unanticipated problems. He provides a vast flexibility of action for operation, correction, and maintenance of scientific and technological instrumentation and equipment that characterize his present usefulness in airplanes and in the scientific laboratory.

In order to provide the capability for the manned exploration of space, a progressive program of research and development has been undertaken. A broad range of investigations, directed to the solution of basic technological problems concerning vehicular configurations and construction, human factors, life-support equipment and accommodations, launching systems, stabilization and control, reentry and recovery systems and techniques, operational and scientific instrumentation, and other vehicular subsystems, is underway. These investigations are presently directed toward solution of the problems associated with the Nation's first manned venture into orbit—Project Mercury. On the basis of extensive studies, it was determined that Project Mercury should be based on the use of an ICBM booster launching system and on a ballistic type of reentry into the atmosphere. The use of ballistic reentry offers the best potentiality for early success because of the relative simplicity and reliability of this approach. However, ballistic reentry pays for its simplicity with landing point dispersions that will be operationally and economically unacceptable for extended use. As Project Mercury nears completion, extensive studies and configuration tests in wind tunnels and free flight will be undertaken as part of a program to develop the capability for landing point control.

A crucial part of the system for attaining landing point control is the stabilization and control system. It is important that this system

be capable of both manual and automatic operation, in order to enhance reliability through human backup and in order to allow for the use of onboard human judgment to vary the landing site choice. A comprehensive study, including flight simulators for pilot training, will be required to provide this capability.

In order to meet the foremost objective of Project Mercury—the attainment of manned orbital flight at the earliest practicable date—additional funds in the amount of $12,200,000 have been requested as a fiscal year 1960 supplemental estimate. The additional $12,200,000 is required to pay for contractor overruns, changes in capsule design and construction, and for added capsule requirements. The design changes and added requirements have arisen as a result of development tests and a continuing study of safety requirements. The compressed time-phasing of Project Mercury between inception and schedule flight has required that research, development, design, and fabrication be undertaken simultaneously. Under these conditions, experience has required that modifications to design, arrangement, and structure, be made during the conduct of the program. Efforts to make the Project Mercury system as safe as humanly possible have inevitably added to the cost, as detailed analyses have uncovered new schemes for enhancing the safety and reliability of the system.

During the fiscal year 1959, much of the preflight research and development effort for Project Mercury was accomplished and contracts were let for major components of the system. Specifications for the worldwide radio tracking network were prepared and sent out to prospective contractors.

During the fiscal year 1960, the major part of the Mercury preflight and flight development program will be completed, and component qualification and astronaut training flights will be initiated. The tracking network will near completion during this period.

During the fiscal year 1961, it is anticipated that the Mercury qualification programs will be essentially completed and that the tracking network will become operational. Large expenditures for the recovery operations and for the operation of the tracking network will be added to flight hardware purchases.

Systems for achieving landing point control will also be under study during the fiscal year 1961. In this connection, two major problem areas require immediate attention: the use of lift to reduce the landing area, and guidance and control methods for piloted landings. Extensive analyses will be made, and scale models of controllable reentry vehicles will be evaluated in wind tunnels. Flight simulators will be used to evaluate the pilot's capability to fly such vehicles.

E. VEHICLE SYSTEMS TECHNOLOGY

The National Aeronautics and Space Administration is asking for $21,200,000 in support of this research program. The objectives are to conduct studies and to develop materials, components, subsystems, and systems which will provide the optimum structure, configuration, guidance, control, and orientation and auxiliary power systems for space investigations such as deep space missions, lunar missions, and earth satellite projects.

Space exploration depends upon guidance, control, attitude, and stabilization equipment for placing vehicles into the desired trajectories and with the desired orientation. Much of the guidance and stabilization technology which has been developed for the ballistic missile is applicable to space exploration. For example, injection guidance for space missions may be directly appropriated from ballistic missile experience, with only the additional developments required to produce lighter weight systems and to adapt existing knowledge and guidance technology to larger boosters such as the Saturn. However, the total requirements generated by space missions are different in both kind and degree. Consequently, development effort is required to provide vehicle and component control at great distances from the earth. These developments relate to components and systems for sensing and modifying the velocity of spacecraft in a manner to follow prescribed trajectories. They also are needed for stabilizing spacecraft and components with respect to known coordinate systems such as those involved in establishing a proper propulsion thrust vector, controlling temperature through heat absorption or radiation, or in collecting solar energy. Further system developments are needed for sensing position and orientation of spacecraft, subsystems or components, and for providing reaction forces to modify the orientation required in such applications as maintaining communication through the use of high-gain antennas.

Successful space missions also depend upon the protection of scientific instruments from the hostile environment of space. The pursuit of this objective leads to research on materials to provide protection through the fabrication of durable but lightweight structures or by the development of resistive materials from which components or instruments can be assembled.

In the area of vehicle engineering, emphasis is on structural aspects and integration aspects of the variety of subsystems which compose the spacecraft. As a part of this effort there is a study on types of propulsion systems which should be used under different conditions; studies on landing techniques; and a look at the general problems of entry and reentry.

Guidance and control activities during the fiscal year 1959 were restricted to research on components and to a study of NASA space mission requirements, with the objective of defining a productive guidance approach. During the fiscal year 1960, the first steps outlined in the guidance study are being undertaken: (1) the start of work on a first generation, or phase I, inertial injection guidance system utilizing analog techniques and guiding all stages of the launch booster, (2) start on a phase II inertial guidance system utilizing digital techniques and possessing great flexibility in programing, and (3) the development of a completely digital precision autopilot for use in earth satellite missions which require supervision through burnout of the final booster stage but which can be accomplished with less expensive control mechanisms. Radio guidance techniques were extended to the post injection, or midcourse, portion of space flight. Efforts at first generation vehicle-contained midcourse guidance, terminal guidance and attitude control will be undertaken during the fiscal year 1960 in the spacecraft developed as the connecting link between the capability of the Agena B booster and the desired circumlunar, or rough lunar landing missions.

In the fiscal year 1961 a start will be made on vehicle-contained capability for trajectory corrections. Terminal guidance and attitude control will be continued in conjunction with the dvelopment of more sophisticated spacecraft to be carried on advanced boosters. Guidance and control equipment will be designed to provide the capability of circumnavigating a celestial body, establishing precise orbits, circularizing elliptical orbits at prescribed altitudes, controlling the approach and letdown for soft landings, and providing a means for sample return from the moon and reentry into the earth's atmosphere either from escape velocity or from a satellite orbit. This will be accomplished through the evolutional development of vehicle-carried systems. Component development for controls and sensors must be carried on at a parallel rate.

Materials research will require increased emphasis during the fiscal year 1961 to provide knowledge relating to the behavior of materials under the three conditions of thermal equilibrium, namely, space flight, the cold lunar night, and the lunar day with its high level of infrared reflection; to thermal shocks resulting from transitions between these stages of equilibrium; and relating to the effects on materials during reentry from either escape velocity or satellite orbits.

F. SPACE PROPULSION TECHNOLOGY

1. Solid rockets, $2,800,000

The progress of solid fuel research for high performance rockets has been advancing at an ever-increasing rate. NASA is requesting $2,800,000 to further its efforts in this area. The objectives are to establish, on an experimental basis, the background which will allow exploitation for space vehicle use of the high reliability, simplicity, and economy of solid propellent engines; demonstrate advanced techniques in the use of very high performance solid rockets as upper stages and as auxiliary rockets for space vehicles; develop techniques for improving the utility and versatility of solid propellent rockets by devising improved and advanced methods for thrust vectoring, modulation, and termination; conduct studies and experimental programs to establish the application of solid propellent motors as first stage high thrust boosters for space vehicles; and to explore techniques for exploiting the properties of solid rockets for sounding vehicles to obtain greater simplicity and economy.

Solid propellent rockets have several inherent advantages. From a logistic and handling standpoint, they are storable for extended periods of time, they utilize simple operating principles, they involve essentially no complex machinery, they are generally transportable in the loaded condition, and they offer advantages of simple firing techniques for relatively untrained launching crews. These general characteristics make for high reliability and, in general, lower costs in development and use compared to liquid rocket systems. The basic characteristics of solid rockets also allow them to be fabricated readily in different sizes on a short development time scale.

From a performance standpoint, solid propellent rockets have two inherent characteristics which can be exploited to great advantage for propulsion in space booster vehicles. First, the physical properties of solid rockets allow them to be constructed to very high ratios of propellant to inert parts when employed as upper stages in a vacuum

environment. The second advantageous performance characteristic is the ease with which thrust levels can be varied. It is not distinctly more difficult or expensive to develop thrust levels of 1 million pounds as compared to the 100,000- to 500,000-pound thrust levels now employed.

The utility of solid rockets is limited by the present cumbersome and relatively inefficient techniques for controlling thrust level during burning, for terminating thrust, and for obtaining thrust directional control. In addition, the inability to reignite a solid motor after initial termination decreases its utility as a terminal stage or as a retrorocket. While high propellent-mass ratios of 0.96 to 0.97 are achievable in solid rockets, little has been done to demonstrate on a significant size scale the achievement of such performance.

The proposed program will aim at improvement of the deficiencies discussed above and at the demonstration of some of the performance, reliability, and logistic advantages of solid rockets. A program will be continued to evaluate and develop new propellants for space propulsion as new ingredients and propellent materials become available.

The solid rocket program is divided into four parts as follows:

High performance motors.—In the fiscal year 1959, work was initiated to demonstrate the feasibility of rocket motors with a propellant to loaded motor weight ratio of 0.96. In the fiscal year 1960, a limited number of static firings are being conducted to prove out these designs. In the fiscal year 1961, work will be continued on advanced techniques for achieving ratios of 0.96 and beyond, and for solving associated propellent geometry, case, and nozzle design and development problems. Advanced techniques for achieving economical sounding rockets of high performance will also be explored. Sufficient data should be available by the fiscal year 1961 to conduct design studies and initiate development of very high performance terminal stages for specific space vehicles.

Advanced thrust modulation and vectoring systems.—Limited work was initiated during the fiscal year 1959 on exploring the feasibility of thrust modulation by ultrasonics. The 1960 program is expanding the effort on thrust modulation and includes work on the exploration of new techniques for thrust vectoring and thrust termination. In the fiscal year 1961 work will be continued on the most promising programs. Studies to apply some of the advanced techniques to specific solid motors will also be initiated.

High performance propellent systems.—In the fiscal year 1959 work was initiated on the evaluation of new propellants and ingredients, and on their incorporation into propellent systems for application to the unique needs of space propulsion systems. This effort will be continued in the fiscal years 1960 and 1961 with particular emphasis on exploiting the new ingredients and materials that are being synthesized and developed under programs sponsored by the Department of Defense.

Improved motor materials and manufacturing techniques.—Solid rockets for space applications require manufacturing techniques of high reliability and precision. Fiscal years 1959 and 1960 programs were initiated on nondestructive inspection techniques, inspection criteria, and on advanced methods of fabricating rockets, such as building a loaded rocket motor in separate sections and then assem-

bling them. These programs will be continued, and the nondestructive testing techniques and inspection criteria developed will be applied to motors actually being manufactured for application to space vehicles.

2. Liquid rockets, $63,000,000

In considering the allocation of $63 million by NASA to research and development of liquid rockets, the committee explored very thoroughly the programs associated with research on liquid hydrogen-oxygen fueled engines intended for upper stages of the Saturn clustered million-and-a-half-pound-thrust rocket, such as the Centaur.

The objectives of the current program being conducted by NASA are to develop an advanced capability for launching and propelling payloads for space exploration through the use of liquid propellent rocket engines; to improve the performance of space vehicles through the development of improved propellants and equipment; and to work out practical solutions for the technical problems occurring in development and operation of liquid propellent engines.

The liquid propellent rocket is the mainstay for propulsion of the present and coming generation of space vehicles. To provide capability for launching and propelling payloads for space exploration requires the development of several new high-performance engines of different thrust levels. These include a large booster engine, engines using hydrogen-oxygen propellants in upper stages, and engines using propellants that are storable for prolonged periods of time in the space environment.

For missions aimed at launching large manned vehicles into orbit around the earth or for delivering large instrumented payloads on the surfaces of the planets, booster thrust levels significantly greater than those of ICBM engines are needed. Accordingly, a 1,500,000-pound thrust engine is now under development. Manned vehicular landings on the surface of the moon or planets with return to the earth can be accomplished by clustering four to six of these engines into a first-stage booster.

The full payload carrying capability of the booster engines can only be realized by the use of upper stages equipped with engines using high energy propellants. The use of hydrogen-oxygen as the propellant for upper stages of space vehicles will increase carrying capability about 50 percent per stage as compared to hydrocarbon-oxygen engines. One large engine using hydrogen-oxygen propellants is now under development. Experimental tests have demonstrated the feasibility of building an engine with a thrust level suitable for use with advanced vehicles on space missions.

A contract to develop a single-chamber engine of 1,500,000 pounds thrust was let in 1959. During the fiscal year 1959, thrust chamber hardware was fabricated and preliminary thrust chamber tests were begun. Other components of the engine were designed. Modification of existing test facilities to accommodate this engine and construction of one new test facility necessary for engine testing were undertaken by the Air Force. Fabrication of engine components and extensive testing of all elements of the engine will be started during the fiscal year 1960. Initial assembled engine tests with continued component development are scheduled for the fiscal year 1961.

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During the fiscal year 1960, a development effort will be initiated on a large engine using high-energy propellants for application to advanced vehicles.

Applied research and experimentation as well as analytical investigations on advanced engine types will be carried out. Applied research on engine problems in the fiscal year 1959 was devoted to a determination of the feasibility of large thrust single chamber boosters. In the fiscal year 1960 applied research will include analytical and experimental investigations into causes and methods of avoiding combustion oscillations in large rocket engines, and applied research required in further development of the 6,000-pound thrust storable propellent rocket. In the fiscal year 1961 applied research funds will be used to continue the combustion oscillation investigations started in the fiscal year 1960, and to start a project to investigate liquid propellants capable of being stored in a space environment for prolonged time periods.

The fiscal year 1961 advanced engine design investigations will include an investigation to determine methods of simulating operational characteristics of large engines through model tests; and the continuation of injector, thrust chamber, heat transfer, and chamber fabrication investigation pertinent to storable-propellent engines.

3. Nuclear systems technology, $10,000,000

A total of $10 million is being allocated by NASA for this area of research which contains much promise for future application to rocket propulsion in deep space. The objectives of the program are to develop the components and technology required to permit the development of nuclear-powered systems to deliver large payloads to interplanetary objectives. The current emphasis in this program is on solution of the many technological problems that now stand in the way of nuclear system development.

The two principal types of nuclear systems that are considered suitable for the propulsion of high payload rocket systems in space are the nuclear heat transfer rocket system and the electrical propulsion system using a nuclear reactor system to generate electrical power. The nuclear systems technology program supports the work on the nuclear heat transfer rocket system and on the nuclear reactor electric power generating systems.

The nuclear heat transfer rocket is a system in which hydrogen is heated to high temperatures in a nuclear reactor to produce specific impulses in the range of 700 to 1,000 pounds of thrust per pound of hydrogen flowing per second. The high specific impulse potentially available from the nuclear heat transfer rocket permits the delivery of large payloads for various missions requiring high energy. The nuclear rocket can be used in booster rocket systems as well as in the space environment. Although early emphasis in the nuclear heat transfer rocket program was on research aimed at the development of large thrust or high reactor power first-stage rockets, the current goals of the program are aimed at accumulating the necessary research information required to develop a reactor flight test system that would be launched by chemical rockets. Such a system could eventually be incorporated into a space vehicle stage which would take off for its interplanetary objective after having been launched into an earth orbit by large chemical rockets. In this program, the NASA is working with the Atomic Energy Commission.

Nuclear reactor electrical power generating systems are required to supply the electrical power needed to accelerate charged particles or neutral plasmas to high velocities in order to produce thrust in the electrical propulsion systems which appear to have good capabilities for space missions. (The accelerator or thrust production components of the electrical propulsion systems are discussed under the program entitled "Space Power Technology.") Analyses of space mission capabilities of these electrical propulsion systems have indicated that such systems will be competitive with the low thrust nuclear heat transfer rocket system described above. One of the disadvantages of the electrical propulsion system is the long trip time involved as the result of the low ratio of thrust-to-stage weight. One of the advantages of the electrical propulsion system is that the electrical generating equipment may be used for communications when the payload has been propelled to its planetary objective.

It is one of the purposes of the present program to do the research necessary to develop high power, lightweight nuclear reactor electric generating systems. It is felt that the development of such high-power systems must wait for the accumulation of various fundamental data and research on critical components of the system. In addition to the funds required for applied research leading to advanced high-power systems, funds are included in this program to continue the development of a system for converting energy from nuclear heat to electrical power using currently available information. This conversion system will be matched with the SNAP–8 reactor being developed at the request of the NASA by the Atomic Energy Commission. This reactor electric system will produce enough power to supply communications needs for planetary missions as well as to test early versions of electrical propulsion systems.

The work under this program is divided into nuclear reactor electric generating systems and nuclear heat transfer rockets. The fiscal year 1959 funds for nuclear reactor electric generating systems were used to design conversion equipment for a nuclear-electric system (SNAP–8) and to initiate fabrication of the components. In addition, work was started on the acquisition of data that will be required in the design of higher power, higher temperature systems. Funds for the support of the nuclear heat transfer rocket reactor test program were transferred to the Atomic Energy Commission to undertake the development of a pump that will be used in the test program. In addition, funds were used to initiate experiments (such as the effect of radiation on the properties of materials at cryogenic temperatures) that will supply information necessary in the eventual design and operation of nuclear rockets.

In the fiscal year 1960, the components of the nuclear electric system will be fabricated and component testing will be initiated. The work on the fundamental information required to permit the design of higher power, higher temperature systems will be expanded. For instance, work will be undertaken on the corrosion characteristics of high temperature working fluids. The support of the reactor test program will be expanded. The development of a pump for operation under the conditions required for early reactor testing will be completed, and research and development on a pump drive system will be undertaken. Work on the fundamental information that will

be required in the design of nuclear rockets will be expanded. For example, work on shielding methods will be undertaken. The test loop for the study of radiation effects at cryogenic temperatures will be designed, fabrication will be started, and preliminary tests will be run.

In the fiscal year 1961 the first conversion system tests will be run as part of the nuclear-electric system (SNAP–8) development program. Much of the fundamental data required for the design of components of a high-power, high-temperature system should be completed so that early applied research design and experimental studies should be initiated on critical components of such systems. In the nuclear heat transfer rocket program, it is planned to develop the turbopump to full rated performance for use in higher power reactor tests than those considered in the fiscal year 1960 pump development. Work will be expanded on the other nonnuclear components that will be required in the nuclear rocket system.

4. Space power technology, $8,000,000

NASA has requested $8 million to continue the development of electrical thrust devices and electrical power supplies based on energy sources other than nuclear reactors for application in space vehicles.

Nearly all space vehicles require an electrical power supply (auxiliary power unit) to provide electricity for operating instruments, communications, and other equipment. Solar cells and batteries are usually used, but for power requirements of 0.5 to 30 electrical kilowatts, other systems should be developed which will have a lower weight, higher reliability, or lower cost. Solar-heated systems using mechanical or static power conversion equipment appear promising for long-duration missions in space. Chemical auxiliary power systems are desirable for certain missions. Improved storage batteries or regenerative fuel cells are desirable for energy storage in conjunction with solar auxiliary power unit systems. By placing reliance on the progress to be made in various programs sponsored by the Department of Defense, it is possible for NASA to limit its program on auxiliary power units in the fiscal years 1960 and 1961 to the development of a 3-kilowatt solar auxiliary power unit, with limited support of applied research and development on advanced solar and chemical systems.

Electrical propulsion systems are desirable because of their low-propellant consumption for certain space missions. Applications include attitude control, orbit correction, main propulsion, and vernier control of velocity for spacecraft which have initially been boosted outside the earth's atmosphere. Research and development is needed on propulsion by means of arc plasma jets, ion rockets, and plasma acceleration systems, for potential use with nuclear-electric and possibly solar-electric power supplies.

Funds for the fiscal year 1960 will be used to initiate the development of a 3-kilowatt solar auxiliary power unit, and to conduct applied research and component development on advanced solar and chemical power systems and on arc plasma jet and ion propulsion.

Funds for the fiscal year 1961 will provide for the continuation of applied research and component development projects and for initiating the development of plasma jet and ion propulsion systems. The scheduling of the development of electrical propulsion systems will

be phased to match the availability of electrical power supplies, such as the SNAP–8 nuclear-electric power system.

G. VEHICLE DEVELOPMENT

1. Delta, $12,500,000

In order to provide a reliable space flight vehicle for medium payload satellites and small payload space probes, and to replace the present Thor-Able, Juno II, Jupiter C, and Vanguard vehicles, NASA is asking for $12,500,000.

Space projects to date have utilized vehicles that have been adapted from military ballistic missile boosters. While providing valuable interim service, most of these vehicles suffer from technical limitations that restrict their desirability for long-term application as space vehicles.

The Delta space flight vehicle will replace the small-payload vehicles currently in use. It will be similar to the Thor-Able, but will have a coast-phase attitude control system, permitting higher injection altitudes. Delta will be a three-stage vehicle in which the first stage will consist of a production Thor missile with the nose cone and guidance unit removed. The second stage will consist essentially of the second stage used in Vanguard and Thor-Able with an improved radio-inertial guidance system of higher accuracy. The third stage will be a solid propellant rocket motor developed for Vanguard.

The Delta vehicle will be applied to a number of satellites and space probe projects. It will have a payload capacity of 300 to 500 pounds for satellite applications and up to 65 pounds for probe shots to the vicinity of the moon. Delta will be useful for both inclined and polar orbits and will be launched from both the Atlantic and the Pacific Missile Ranges. Requirements for greater lunar payload capability and for increased accuracy in achieving close tolerances for orbital circularity, and special demands for obtaining attitude stabilization of certain payloads, have all combined to dictate more stringent design limits on the vehicle. In the fiscal year 1961, funds will be expended to develop hardware intended to yield more precise and controllable flight paths and velocities while at the same time increasing payload weight capacity and attitude orientation.

The Delta program is divided into five parts: The fabrication and test of the modified Vanguard/Thor-Able second stage; the procurement and test of the guidance system; the modification of the Thor boosters; the integration of the complete Delta; and the preparation and launch.

Incremental funding for this program, including the procurement of 12 vehicles, was initiated during the fiscal year 1959. All phases of the vehicle engineering program have proceeded on schedule.

Funding for the fiscal year 1960 and beyond is required for the planned continuation of the initial contract. Specific sums proposed for obligation in a given fiscal year are not associated with particular vehicles. However, the fiscal year 1960 funding essentially supports hardware fabrication and flight operation costs for east coast launchings; and the fiscal year 1961 funding will support similar operations from the west coast and will also initiate the vehicle improvement program to increase reliability, accuracy, and performance.

2. Centaur, $47,000,000

A total of $47 million is being requested by NASA to develop a general purpose space flight vehicle employing a high-energy fuel in an upper stage.

Centaur is a two-stage vehicle whose first stage is a modified Atlas D missile. The modification consists of replacing the cone frustum part of the forward liquid oxygen tank with a cylindrical section having the same diameter as the rest of the Atlas. Between the lower and upper stages is a structural adapter that is attached permanently to the lower stage. The upper stage is mounted on top of the adapter which is jettisoned with the modified Atlas booster. Sets of hydrogen peroxide rockets are utilized for upper-stage attitude control during the coast period. The significant feature of Centaur is the use of liquid hydrogen as a fuel, thus providing a launch vehicle of much greater capability than previously available.

The Centaur project was transferred from ARPA to NASA on July 1, 1959. Technical direction is by an Air Force team located at the Air Force Ballistic Missile Division and reporting directly to NASA Headquarters.

The Centaur missions will involve placing communications satellites in a stationary 24-hour orbit, and lunar and planetary probes. The first six developmental vehicles will be used for both vehicle systems tests and for payload missions.

During the fiscal year 1959 the Air Force let incrementally funded contracts for the development of the Centaur engines, for the development and fabrication of the Centaur second stages, and for the modification to the Atlas boosters.

The existing contracts will be continued under NASA funding during the fiscal years 1960 and 1961. During the fiscal year 1960 static tests of the complete Centaur powerplant will be run and preliminary design will be completed on the second stage. Tests will be initiated to simulate zero-g conditions on the liquid gas tank during coasting flight.

The final design of the Centaur powerplant and second stage will be completed and the flight test program will be started during the fiscal year 1961.

3. Saturn, $134,308,000

The National Aeronautics and Space Administration is requesting a total of $134,308,000 to develop the Saturn, a million-and-a-half-pound thrust, multistage, launching vehicle to be used for various advanced space-flight missions.

The Saturn program comprises a series of multistage launching vehicles of increasing payload capability for performing various space-flight missions. Minimum requirements for three important missions are (1) to send large payloads to the moon and near planets, (2) to place several tons of payload in a 24-hour equatorial orbit, and (3) to place a manned spacecraft (such as Dynasoar) in an earth orbit. The first version of Saturn is designed to meet these requirements. Succeeding Saturn vehicles will have greatly increased capabilities for all three of the missions previously mentioned. The increased capability is to be obtained by using upper stages from the early versions as building blocks in the final vehicle, thus, minimizing the number of new stages that have to be developed. The Saturn's first

stage is propelled by a cluster of eight ICBM-type engines which deliver a total thrust of 1½ million pounds. The final version of Saturn will use uprated engines giving a thrust of at least 2 million pounds. The first Saturn vehicle will be a three-stage rocket; the final version may have five stages. Launching of the first Saturn booster with dummy upper stages is scheduled for the latter half of 1961.

The Saturn project was initiated on August 15, 1958, by an order from the Advanced Research Projects Agency to the Army Ordnance Missile Command. The project was funded in the fiscal years 1959 and 1960 by ARPA. The President of the United States, on November 2, 1959, announced his intention to transfer the Saturn project to NASA. In anticipation of the transfer, NASA and the Department of Defense have established an interim working agreement that provides for immediate assumption by NASA of the responsibilities for the technical management of the Saturn vehicle development.

During the fiscal year 1959 the design of the first-stage booster and the design of tooling for the first-stage clustered tanks were initiated.

During the fiscal year 1960 the design and development of the first-stage booster was undertaken. Construction of prototype tankage proceeded, and individual engines were delivered for test. A captive firing of the eight-engine cluster is scheduled for the latter half of fiscal year 1960. Contracts for upper-stage engines and vehicles will have been let before the end of fiscal year 1960.

The fiscal year 1961 funds will provide for the continued development, construction, and testing of the first-stage booster tanks and engines. In addition, design and development of upper stages, initiated in the fiscal year 1960, will be continued. Part of the fiscal year 1961 funds will provide for the development of vehicle-borne guidance, controls and instrumentation, and the development of ground-service equipment.

H. TRACKING DATA AND DATA ACQUISITION, $32,550,000

A request of $32,550,000 is made by NASA to operate tracking and data acquisition facilities necessary to support the overall NASA space-flight program; to provide tracking and data acquisition support for space-flight operations upon request by other Government agencies; and to provide for research and development on improved tracking and data acquisition systems and equipment. Major technical objectives included in fiscal year 1961 program are:

(*a*) Improvement of the overall accuracy and efficiency of existing NASA tracking stations.

(*b*) Development of a prototype electronic tracking system of inherently greater precision than any present system.

(*c*) Development of communications techniques for spacecraft at planetary distances.

(*d*) Speedup of data handling to reduce timelag between the experiment and the conclusions.

(*e*) Development of special trajectory measuring techniques and systems for complex payloads.

In all cases of space-flight operations, whether a scientific satellite, a space probe, a sounding rocket, or a manned vehicle, there is a need for tracking units capable of delivering orbital data or position time histories, and a need for telemeter receivers for data acquisition. These devices must be properly coordinated by communications links to permit the data to be transmitted to a suitable computing center, where it may be rapidly reduced to a form in which it can be studied and analyzed by the scientists. The data represent the raw material from which the scientific experimenters will gain their new knowledge of space. The quantity and quality of this raw material will determine the progress made in space research.

While the NASA network of stations is designed to afford the maximum amount of operational flexibility, there are special conditions associated with each test which may require equipment modifications, or in certain cases, the temporary installation of new items of equipment at new tracking locations.

In order to minimize the requirements for new stations, or to compensate for temporary deficiencies, the NASA proposes to provide support to cooperating non-NASA stations which are suitably equipped to perform a useful function for the purposes of a particular experiment.

Advanced technical development

Tracking and data acquisition systems development.—A continuing effort must be maintained to advance the state of the art in tracking systems and methods, in data reduction and analysis techniques, and in methods of telemetry and data transmission. Specific areas of basic research include theoretical studies and experimental verifications of the effects of propagation delays on various transmissions of time signals since accurate time measurement to within a fraction of a second is necessary in refined calculations of orbits; theoretical and applied research in low noise preamplifiers to improve reception of faint radio signals; theoretical studies and analysis of improved orbital computation methods; and studies into techniques for communicating with space vehicles at planetary distances.

In addition, development of refinements in the measuring capabilities of present minitrack systems is contemplated to meet more exacting requirements. Included are the development of such items as a rubidium-vapor, frequency-standard equipment to improve calibration accuracy; precision propagation delay measurement equipment; onsite data reduction systems; and prototype calibration equipment to calibrate tracking systems.

The development of new types of tracking and data acquisition equipment is proposed which will have more accuracy than present systems. This work will include new antenna systems and receivers to operate at higher frequencies (2000 megacycles); transmitters for range determination; self-tracking systems for directional antennas; and payload beacons for use in conjunction with the ground systems.

Computer support programs.—Studies will be undertaken to determine the best modulation technique for data acquisition and for the adaptability of the data received to computer programs for reducing the data. Consultative services will be used in this research effort.

Data systems development.—Work will be continued in this area to foster the development of automatic data reduction techniques as

well as to improve the data reduction on data now being received from telemetry systems operating in satellites in orbit.

Optical systems development.—It is proposed to improve the present capability in this basic method of tracking especially for geodetic programs. Improvements are necessary in the timing system and in the methods of reducing data from photographic film accurately and rapidly. Electronic-optical techniques will be investigated to marry the advantages of electronics and optics into an improved system for tracking optically. Other work will include star cataloging, application of optical tracking to lunar or deep space vehicles, exploration of possible uses of optical telemetry, improvements in image converters and photodetectors, and the use of light reflectors on payloads.

Mercury tracking net techniques.—The Mercury tracking net will undergo continuing refinement and improvement to insure maximum effectiveness and reliability. Work will continue on data error analysis, telemetry systems, tracking techniques, and communications as applied to manned space flight. The use of contract consultants is relied on heavily in this work.

Development of high gain antennas.—Many long-range problems are involved in developing equipment to meet the requirements of communicating with vehicles at distances of millions of miles. While payload power is expected to increase, it will still be necessary to improve the antennas and receivers on the ground. In this connection it will be necessary to do considerable research and development to design and develop techniques and systems to economically improve upon present large antenna systems to receive relatively faint signals.

Trajectory measurement and command equipment.—Special types of equipment are needed for vehicles whose controlled trajectory go well beyond the range of established launching ranges. The type of equipment required will depend on the characteristics of the payload, and what command control functions are involved. Certain vehicles will have capability for stopping and starting powered flight in last engine stages. To control the operation of such stages at remote locations will require development of special trajectory measurement and command control equipment.

Flight research program

Operation of satellite (Minitrack) stations.—During the fiscal year 1961 there will be 14 Minitrack operating stations, including four new ones being installed during the fiscal year 1960. These stations employ radio interferometers and are used primarily for tracking satellites which send out radio signals, where precise real-time data is not required. They have all weather capability. They cannot track passive satellites (ones which do not emit signals) nor can they provide the precise orbit data available from optical systems. They have the advantage of being able to detect the angular direction of a satellite with respect to the station without prior information as to precisely where to look. These stations must be located in areas free of extraneous electrical disturbances. From a number of observations from different stations, a reasonable orbital determination can be made.

Each Minitrack station receives and records telemetry data on magnetic tape. Data from these stations are fed to a central control, communications, and computing center at the Goddard Center.

Automatic data read-out equipment is being provided to speed up data collection and to permit tracking a greater number of satellites.

The operational cost of three Microlock stations is included in the 1961 estimates. These stations will be managed by the technical personnel that manage the Minitrack stations. The Microlock stations may eventually be integrated into the Minitrack net at common locations with the Minitrack stations.

Operation of optical tracking stations.—The existing twelve Baker-Nunn optical stations will continue in operation during the fiscal years 1960 and 1961 under the technical and administrative direction of the Smithsonian Astrophysical Observatory.

The optical stations can photograph relatively faint space objects (satellites) against star backgrounds to provide a precise determination of the angular position of the object. Observations can only be made when the visibility is good and by virtue of sunlight reflected from the object. Therefore, observations can only be made in periods of clear twilight. Moreover, the camera can only see a small segment of the sky at a time, and it must have a prior knowledge of where to look or the satellite will pass out of range before the camera can search any appreciable segment of the sky. Information on where to look is usually obtained from Minitrack or similar electronic systems which do not have the acquisition limitations of optical systems.

It is theoretically possible from three or more optical observations to obtain the most precise orbital data of any technique known. For certain geophysical experiments, such as in geodetic and air drag experiments, the maximum precision of optical techniques is necessary. The optical stations must be located at sites where the weather conditions are such that good visibility genarally prevails. This site limitation is not necessarily compatible with the site locations of electronic systems, which have other criteria governing their best location.

Included in the cost of operating the optical stations is the cost of data transmission, data reduction, and data interpretation which is performed by the Smithsonian Astrophysical Observatory at Cambridge, Mass. Funds are included for the cost of the Moonwatch teams which are volunteer groups assisting the Smithsonian Astrophysical Observatory in securing observations of satellites at different places in the world, using simple telescope equipment. The compensation to the Moonwatch teams merely defrays expenses for materials and for certain items of equipment. There is no compensation for the volunteer services as such.

Operation of the deep space network.—During the fiscal year 1961 it is expected that three stations will be operational. The JPL station at Goldstone, Calif. is currently operational; the Woomera, Australia, station will be added during the fiscal year 1960; and the South Africa station will be completed during the fiscal year 1961.

The deep space stations are used primarily for tracking and data acquisition from vehicles penetrating deep into space, such as lunar probes. They may also be adapted for gathering larger amounts of data, such as may be involved in the transmission of TV pictures from space vehicles. They are not suitable for satellites in low orbits because of the low tracking rates of the antennas. They have great sensitivity, however, to very faint signals which cannot be detected by ordinary electronic systems. They also are being equipped to be capable of transmitting signals to space vehicles at great distances for

the purpose of issuing commands to the vehicle. The transmitters will also be able to be used for communications satellite experiments.

Funds are included under this heading for the contractual services required in the operation of auxiliary portable trajectory tracking and command station equipment in the fiscal year 1961 to meet operational requirements involved in trajectory measurement and guidance functions on deep space probes.

Operation of Mercury net stations.—A total of about 18 stations are included in the Mercury network of stations, including the control center and the communications and computing center. The operation of these stations and the recovery operations will be a joint effort involving the Department of Defense, foreign countries, and NASA. The communications system will primarily utilize leased commercial lines and military circuits.

Operation of non-NASA stations.—The NASA will make use on a part-time basis of a number of cooperating non-NASA stations which provide tracking capability. Examples are the facilities at Jodrell Bank, England, and at Fort Churchill, Canada. The extent of the NASA use of these facilities is arrived at by mutual agreements based on the duration and complexity of the particular experiments. In certain cases the NASA may provide funds for special items of equipment needed to accomplish particular experiments.

Operations at AMR and PMR stations.—All NASA sounding rockets, satellites, or space probes will be launched during the fiscal years 1960 and 1961 from either the NASA Wallops Station, the Canadian station at Fort Churchill, or the Department of Defense AMR or PMR stations. The majority of the launchings will take place at the AMR station. Reimbursable items of cost for use of the AMR and PMR stations will include utilities for NASA offices and operations and special items of equipment related specifically to NASA experiments in specific missions.

Other operational costs.—A portion of the funds requested under this program will be used to procure services involved in the transmission of the data acquired at Wallops to the appropriate communications center and for data reduction services under contract. As the computer capabilities of the Goddard Center increase, the contract costs for data reduction services will decrease.

The NASA will have over 40 tracking stations in operation, including the Mercury stations, in the fiscal year 1961. An estimate of approximately 10 percent of the overall operating costs of the stations has been added to provide adequate funds for maintenance and repair, provisioning of spares and logistic materials such as tapes, and various paper materials.

CONSTRUCTION AND EQUIPMENT

Summary

	Estimated cost
a. Langley Research Center (Hampton, Va.)	$11, 957, 000
b. Ames Research Center (Moffett Field, Calif.)	980, 000
c. Lewis Research Center (Cleveland, Ohio)	9, 100, 000
d. Goddard Space Flight Center (Beltsville, Md.)	9, 500, 000
e. Pilotless Aircraft Station (Wallops Island, Va.)	4, 000, 000
f. Jet Propulsion Laboratory (Pasadena, Calif.)	5, 000, 000
g. NASA Huntsville facility (Huntsville, Ala.)	26, 750, 000
h. Atlantic Missile Range (Cape Canaveral, Fla.)	27, 750, 000
i. Various locations: Tracking facilities	27, 750, 000
Total program	122, 787, 000

A. LANGLEY RESEARCH CENTER, HAMPTON, VA.

The NASA is requesting the sum of $11,957,000 for fiscal year 1961 for this installation.

The first item, in the amount of $7,957,000, is for a hypersonic aerothermal dynamics facility. This facility, when constructed would be used for simulating vehicle environment in the hypersonic speed ranges.

The lack of solution to urgent problems in the hypersonic speed range is seriously retarding the conception and efficient design of new vehicles and the improvement of a wide variety of existing and planned vehicles which must reenter the earth's atmosphere from orbital or space flight or be capable of sustained flight at hypersonic speeds. The study of these problems cannot be undertaken without advances in the capability of simulating the vehicles' environment beyond that obtainable with present-day research facilities. At present, there are no large air tunnels capable of exceeding Mach 12 for significant testing times, and these wind tunnels are not yet capable of simulating the temperatures, velocities, and air densities of flight at this Mach number. Because different types of vehicles have different trajectories, a wide variety of environmental conditions must be simulated. On vehicles such as Dynasoar, for example, the most critical maneuver problem and the most critical heating problem occur at velocities well beyond those obtainable with existing facilities. In addition, for ICBM-type vehicles or manned capsules such as Project Mercury, the critical aerodynamic and materials problems that occur at the high temperatures and velocities experienced by these vehicles cannot be studied efficiently with existing facilities. Current vehicles have many deficiencies in their design because of these facility limitations. Future vehicles will impose even more stringent demands on facilities. For example, some vehicles returning from far-space or lunar missions will reenter the earth's atmosphere at velocities exceeding escape velocity, and the most efficient trajectory for returning freighter vehicles from space could produce air temperatures near the vehicle that would be greater than those for a near-earth ballistic missile.

The facility to be constructed will consist of two main systems, one using air, and the other using helium. The air system will be located in the west wing of the present gas dynamics laboratory, and the helium system will be located in an extension to the west wing. The system using helium as the test medium is required primarily for aeroelastic studies. This system will have two legs with test sections providing test speeds up to Mach 10 in one and Mach 20 in the other. The other system will employ air and will be used primarily for the study of aerothermal problems.

The next item at Langley Research Center is for $4 million for the construction of a dynamics research laboratory.

The development of satellites in the United States has been greatly hampered by lack of adequate facilities for research information on problems in dynamics and hence has proceeded on a cut and try, ad hoc test basis. The dynamic characteristics of vehicles are basic ingredients in the analysis of design for efficient performance and

structural integrity. Lack of information on the dynamic characteristics has contributed to failures. Many of these have been caused by broken and malfunctioning equipment due to large repeated loads which lead to high vibratory response and fatigue of vehicle elements. The motions of the fuel and the vibratory deformations of the vehicle, coupling with the control system, as well as unbalance of the spinning payloads have also caused loss of vehicles. The future ferry-reentry vehicles, space stations, and vehicles for landing on the moon will generate many dynamics problems which must be solved.

Loss or malfunction of vehicles could be avoided and a more efficient structure could be obtained by appropriate applied research and by more comprehensive proof testing of the vehicle components and payloads under conditions which more nearly simulate the combined environments which the vehicles will experience. The laboratory under this project is designed primarily to provide simulated environments, from launch to orbit to landing, for research to obtain the structural efficiency and integrity demanded for high performance and to insure the reliable operation of the vehicle.

The present Langley vibration laboratory was planned nearly 20 years ago and was equipped to vibrate propeller blades and aircraft flutter models. Although some modernization has been made and new equipment added, the present facilities are totally inadequate for vibration research on space vehicles. The proposed facility will provide a larger laboratory, equipped with more versatile equipment of greater capacity designed primarily to do research on, and supplement analyses of, vibration, shock, and other dynamics problems. In order to minimize cost and cope with the size and complexity of existing and planned vehicles, research will be carried out by means of dynamic models, full-scale tests of components, and by the use of simulators.

This project provides for the construction and instrumentation of a research laboratory designed to study dynamics problems of high-performance aircraft, missiles, space vehicles, space stations, and satellite packages in simulated density, temperature, acceleration, and vibration environments. The laboratory will provide the capability for study of both the structural dynamics of the vehicles and their components, and the free-body dynamics with respect to space orientation control, guidance, and navigation. Configurations envisioned include erectable space structures and parallel boost configurations as well as the more conventional configurations.

B. AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.

The bill provides $980,000 for centrifuge equipment at this research center. The Ames 30-foot centrifuge is a minimum facility, using surplus electric drive equipment of marginal performance. It uses approximately two-thirds of the capacity of the existing analog computer, and lacks separate supporting instrumentation. This item of the bill would provide funds for equipment to make the centrifuge capable of independent operation, improve its performance to the designed maximum and equip it with instruments for adequate pilot display and safety of operation.

C. LEWIS RESEARCH CENTER, CLEVELAND, OHIO

NASA is requesting funds in the amount of $9,100,000 for two projects at this center.

The first project, in the amount of $5,050,000, proposes the construction of an integrated complex of facilities for a broad research program on energy conversion and power generation processes and equipment.

A prime requirement for effective space flight and space exploration is lightweight, efficient electrical production devices. Not only is the need for light weight and high efficiency very great, but the power requirements for future space vehicles vary over extremely wide ranges of duration, average power, and peak power. To adequately meet these requirements, a broad research program on a wide variety of energy conversion processes is essential. Such a program must encompass exploratory, basic research on various concepts of direct conversion processes, applied research on turboelectric system components, research into the heat transfer and thermodynamic and hydrodynamic characteristics of novel working fluids.

Exploratory research on direct conversion processes includes the production of electrical energy from heat and radiation of various kinds. Typical concepts requiring experimental investigation are photovoltaic cells of various kinds, photogalvanic cells, microwave amplifiers, thermopiles, plasma diodes, and utilization of energy gaps in semiconductors or artificial metals. Such direct conversion methods offer the promise of improved reliability for long-term space missions through the elimination of rotating machinery. The theoretical efficiencies are comparable to those of conventional electric power generation equipment. The direct conversion devices also hold promise for improved lifetime against meteoroid penetrations of the powerplant waste heat radiator.

To achieve lightweight turboelectric systems requires vaporized and liquefied metals at high temperatures as the working fluid. There are therefore introduced a host of new problems relating to the unusual hydrodynamic and thermodynamic properties of these fluids as well as to the design and operation of such high-temperature components as pumps, turbines, evaporators, and heat exchangers. To rapidly and effectively develop this new technology will require a well-coordinated research program on all these problems. Pumps must be capable of operating with these fluids near their boiling point; turbines must operate with high efficiency and with considerable moisture in the working fluid; the cavitation phenomena of liquid metals in valves and pumps need be determined; the mechanism of the flashing of the liquid into the vapor phase needs study; and knowledge of the general heat transfer, hydrodynamic and thermodynamic properties of these liquids and their vapors is virtually nonexistent.

Major components of the facility requested will comprise highly specialized equipment and instrumentation, suitable laboratory space for the equipment, control rooms, and required services.

The next item at Lewis Research Center is a request for $4,050,000 for a basic materials research laboratory. This facility is required to extend the scope and magnitude of the materials research capabilities of NASA to the field of space vehicles.

D. GODDARD SPACE FLIGHT CENTER, BELTSVILLE, MD.

The sum of $9,500,000 is being requested for the Goddard Space Flight Center.

The first item at this location is for a payload testing facility for which NASA is requesting $3,555,000.

The proposed facility represents an orderly progression in the long-range development of the Goddard Space Flight Center and is in consonance with the rapid scientific developments permitting larger space payloads. Heretofore, the test and evaluation function has had to be accommodated in temporary quarters in scattered locations and has often been accomplished in "borrowed" research facilities with attendant delays.

With the increasing size, complexity, and cost of scientific payloads, it is mandatory that they be thoroughly tested and evaluated as integrated systems prior to actual flight. The facility proposed in this project will permit the simulation separately, sequentially, or in compatible combinations, the extremes of the natural and induced environmental forces which a space vehicle experiences in its life cycle of ground handling, launch, flight, reentry, and landing. The advanced-type research facilities required (limited only by existing technology) will reproduce the effects of solar radiation, the earth's albedo (infrared radiation), the cold of outer space, the vacuum of outer space, primary cosmic or Van Allen Belt radiation, and the induced effects from the booster or control rockets of shock, spin, roll, vibration, and acceleration.

To achieve a high reliability of success in our space vehicles (payloads) it is imperative that a thorough and comprehensive test and evaluation be made of complete systems in prototype and of the flight hardware. Such tests of prototype can resolve technical difficulties at an early stage and thus enhance the quality of scientific data finally achieved. Flight unit hardware can be tested to assure high reliability of mission and avert costly flight failures or mission aborts. For example, malfunctioning of a guidance relay under induced vibrations of launching could be detected in the laboratory which might change a lunar probe from a failure to a success. Or, considering the combined effects of solar radiation and the low pressure (vacuum) in outer space, the malfunctioning of overheated, hermetically sealed electronic units which sometimes explode might be uncovered through a combined thermal-vacuum test. Further, the need for precisely balancing the final flight payload is an absolute necessity. Minor errors here can be the difference between hitting and missing the moon by several diameters. Likewise, the structural dynamics and interactions between multistages or separation of payload and motor can often be determined to the required accuracy only by testing an exact replica of the flight unit under simulated conditions.

In addition to the system test functions to be carried out in the laboratory, the scientific and technical staff will conduct a research and development program concerned with advancing test technology and methods, and attempting "breakthroughs" in simulation techniques and equipments which currently limit ground duplication of space effects.

The next item, in the amount of $4,636,000 is being requested for the construction of a satellite systems laboratory.

The increased thrust being provided by current booster development programs will provide for increasingly larger and more complex satellite systems and payloads. The conception, construction, and integration of these complex systems requires additional facilities and personnel skilled in payload system integration and management.

Typical payloads are those for Nimbus and for the orbiting astronomical satellite. The Nimbus satellite, weighing upward of 600 pounds, contains television, electrostatic tape records, radiation sensors and scanners, and other instruments intended to study the meteorology of the earth. The satellite will contain an elaborate control system consisting of pneumatic and gyrowheel elements for stabilizing the satellite with respect to the earth. Thus, the cameras and other sensors will always be looking straight down at the surface. In addition, a near polar orbit is planned, which will result in much greater coverage. To design and integrate such a complex system as a complete unit, a process necessary for mission success, facilities, and personnel working together in a single area are needed.

Another larger and more complex payload is the orbiting astronomical satellite which will weigh more than 3,000 pounds and contain a vast array of astronomical instrumentation. From this highly stabilized platform, telescopes will be pointed to definite objects of the sky for astrophysical study. Still another type of payload weighing up to 3,000 pounds will be composed of separate satellite systems some of which will be ejected as individual satellites. All components of these systems must be brought together in a single area for integration and systems testing.

The work involved in the integration and testing of these payload systems includes the development of attitude orientation devices requiring gyro- and jet-stabilization systems; the development of precise steering controls for predetermined flight programs; the development of integrated satellite payloads including mechanical, power, and signal compatibility of various experiments or subsystems; the study of special trajectory requirements; flight stability analysis; and the development of separation techniques.

The implementation of this work requires a location at the Goddard Center with access to the instrument shops, the environmental checkout facilities, and the scientific staff developing the sensor components. The proposed building will enable the center to group its scientific, technical, and administrative staff efficiently in accordance with their related functions.

The final item provides for the sum of $1,309,000 for necessary additional utility installations required by the Goddard Center. The project includes provisions for the erection of a security fence and gatehouse, site and road improvements, utility extensions, and additions to the heating plant.

E. PILOTLESS AIRCRAFT STATION, WALLOPS ISLAND, VA.

NASA is requesting a total of $4 million for Wallops Island.

The first item being requested for this station is for $1,910,000 for the precision projectory determination system.

Future research programs require that trajectory parameters be accurately determined at extreme ranges by a system which uses minimum payload weight in the vehicle. This is essential in order to

have useful payload for research experiments while still utilizing economically feasible rocket propulsion systems. Existing and presently planned equipment is capable of velocity determination of only 200 to 500 feet per second at the ranges of these future vehicles. This must be supplemented with a system capable of velocity measurement to 10 feet per second or better to permit accurate prediction of the impact location of vehicles which are used in research programs where recovery of the vehicle is necessary. For example, ablation tests and studies of certain radiation effects in space require recovery of test vehicles.

The system is essential as part of the equipment required to control staging and guidance corrections to achieve the required flight trajectories. When used with the proper command-control system, it will permit correction of the cumulative errors in inertial reference systems which are extremely difficult to hold to the required error tolerances under the increased accelerations experienced in solid-fuel rocket systems. Without this system, it will become increasingly difficult and expensive, if not impossible, to maintain adequate accuracy from internal preset controls.

The next item is for a project being requested to provide a center capable of handling data reduction at the Wallops Station. The amount requested for fiscal year 1961 is $350,000.

The main computing machines will be rented, but it will be necessary to provide funds for (1) the purchase of auxiliary equipment such as film readers, strip chart readers, automatic data plotters, small desk-type calculators, and a tape to card converter for telemetering data; and (2) remodeling part of an existing building at the Wallops Station to house the rented computers and the related equipment.

The final item at Wallops Station involves the improvement on the technical capabilities of the station and is required in three equipment areas. The amount requested is $1,740,000. The equipment modernization involves the following:

Vehicle checkout equipment.—This portion of the project covers the procurement of equipment required in the testing of vehicles and their components prior to launching. The project includes the procurement of microwaves and VHF antenna pattern systems for radar beacon, telemeter, and destruct antenna measurements; the procurement of environmental tests and checkout equipment for vehicles and their associated components; and the construction and outfitting of two shielded telemeter checkout rooms in existing buildings.

Radiofrequency monitoring equipment.—Equipment is required to monitor, measure, and locate radiofrequency interference in the Wallops Station area. The equipment will consist of field strength and frequency meters covering a frequency range from 30 cycles to 1,000 megacycles with recorders and fixed stations and van-type installations. Spectrum analyzers will be employed to cover a frequency range from 10 to 44,000 megacycles to allow spectral observations of pulse signal characteristics, frequency modulation identification, and the comparison of two radiofrequency signals having similar frequency separation. Servo-operated directional antennas will be used to locate interference sources.

Launching and handling equipment.—Additional equipment is required to prepare, transport, position, and launch the larger research vehicles which will be operational in 1961. The project includes a

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launcher and associated cabling, two umbilical towers, and mobile handling equipment.

F. JET PROPULSION LABORATORY, PASADENA, CALIF.

Five million dollars is the total requested for the Jet Propulsion Laboratory at Pasadena, Calif.

The first item at this site is for the acquisition of 3.4 acres of privately owned land contiguous of the southwestern boundary of the Laboratory, for which $60,000 is being requested.

The only other privately owned contiguous site is being rapidly developed and there is every reason to believe that the property under consideration for purchase will also undergo similar development, unless the site is acquired. If this should happen, it will become almost impossible for the Laboratory to extend its present area without excessive and prohibitive cost. Inasmuch as this area is the only privately owned land between the existing Laboratory and the land owned by the city of Pasadena, its acquisition is considered to be a prudent and economical investment. It is proposed to locate the publications, library, and technical services building (funds for which are being requested in this bill) in the area being considered for purchase.

The next item is for $2,335,300 which is being requested for the modernization of laboratory facilities.

This project proposes the modernization of a number of facilities to provide more effective and efficient laboratories and supporting facilities. Brief descriptions of the proposed work follow:

Space sciences laboratory.—It is proposed to construct a two-story frame and stucco building of approximately 16,000 square feet to house laboratories and offices for personnel who will be associated with the new space sciences division. In addition to the office space for technical and administrative personnel, the building will provide laboratories for environmental testing and for electronics and physics research and precision model shops.

Addition to environmental test laboratory.—In the designing of space vehicles it is essential that an environmental test laboratory be available where conditions of outer space can be duplicated and where various components of the vehicles can be tested under these conditions. This project proposes the construction of a 5,000-square-foot addition to the environmental laboratory. The addition will contain offices for the technical and supporting personnel, and laboratories to house the following equipment:

(*a*) Ultra high vacuum system for the simulation of space environments and the testing of guidance, propulsion, and communication system component parts.

(*b*) An equalization noise chamber for the investigation of the effects of acoustical noise on vehicle structures, payloads, and guidance equipment during the launch phase.

(*c*) A control system for the automatic equalization of the random frequency vibration electromechanical exciter system now in use.

(*d*) A test chamber in which the temperature can be varied from −100° F. to +300° F. with the provision necessary to facilitate vibration testing inside the chamber.

Addition to engineering mechanics and design building.—This project proposes a one-story 8,000 square foot addition to the existing engineering mechanics and design building. The addition will consist of a large briefing or conference room capable of accommodating approximately 500 persons, plus two smaller seminar rooms, restrooms and a utility room.

Materials research and processing facility.—The construction of two laboratory buildings is proposed to provide the facilities required to carry out supporting research and advanced development work on materials for space vehicles. The research laboratory building will contain approximately 10,000 square feet and will be designed to house precision equipment of the type needed to study the behavior of materials at extremely high temperatures, such as those encountered in rockets and under conditions of outer space environment. The building will also contain offices for technical and supporting personnel. The processing laboratory will contain approximately 5,400 square feet and will be designed to house some of the fabrication and processing equipment needed to develop and test materials for space vehicle applications. Approximately 1,000 square feet will be assigned for chemical propulsion research and development.

Publications, library, and technical services building.—This project proposes the construction of a 17,000 square foot two-story building to house administrative groups. This building will contain the main library, the reproduction department, (blueprinting machines, printing presses, etc.), a vault, a TWX room, a central documents control room, a document film room, a photo department, editorial offices for the technical reports group, and general administrative offices.

Addition to fabrication services building.—This project proposes a 10,000 square foot addition to the present fabrication services building. It will be of frame and stucco construction. It will be a two-story building with the lower floor devoted to heavy machine shop equipment, a tool crib, a precision instrument and optical shop, and an optical precision assembly room. The second floor will contain the fabrication services offices, restrooms, locker room, inspection and bond room, light machine equipment room, tool crib, precision grinding room, stock control room, and small room for storage of lightweight materials.

Addition to administrative services building.—An 8,000 square foot third-floor addition to the present administrative services building is required. The addition will contain offices and restrooms and will provide additional workspace for the purchasing, accounting, IBM, shipping, receiving, and property departments.

The next item is a request for the construction of a solid propellant facility in the amount of $1,954,700.

The Jet Propulsion Laboratory was established before safety codes dealing with solid rocket propellants were available. Subsequent safety code standards have made most of the solid rocket test facilities at the laboratory nonconforming. At the present time, all but 20 of the 100 facilities on the laboratory site are operating under waivers. These waivers make it impossible to modify any existing facilities to meet the changing program needs and thus severely restrict the potential growth of the solid propellant effort at the Laboratory. The recently acquired 60-acre site has now permitted the relocation of

several solid propellant facilities and associated equipment to a location where required safety code standards can be met. This project provides further relocation of additional solid propellant facilities.

It is proposed that a complex of buildings be constructed to house the solid propellant rockets and solid propellant chemistry sections. The buildings will be designed to process hazardous materials in quantities the Laboratory cannot process in its present installations. All buildings will be designed to operate remotely, if necessary, keeping the safety of the personnel foremost.

Oxidizer process buildings will be arranged to blend, dry and grind hazardous materials in a safe and efficient manner. Included in this complex are remote controlled propellant mixing and casting buildings which will be designed and geographically located so as to be in accordance with ordnance safety manual requirements. The completed solid propellant will be processed in a remotely controlled preparation building and subsequently transported to storage bays for conditioning before static firing. Also included are a group of hazardous storage magazines with a capacity great enough to accommodate a reasonable propellant development program. A solid propellant process laboratory will be constructed to test physical properties, burning rates, analyze oxidizer particle size, impact-sensitivity, and auto ignition of new propellants. Staff labs, chemistry labs, and shops will be provided to support the varied activities of this building.

The sum of $500,000 is being requested for liquid propellant test cells.

Since the Laboratory was established before safety codes dealing with liquid propellant rockets were available, most of the test facilities at the Laboratory are nonconforming. At the present time, all but 20 of the 100 facilities on the Laboratory site are operating under waivers. These waivers make it impossible to modify any existing facilities to meet the changing program needs and thus severely restrict the potential growth of the liquid propellant effort at the Laboratory. This project will complete the move of the liquid propellant facilities and thereby eliminate the waivers of the ordnance safety manual, under which the liquid propellant section is now operating.

The final item at this Laboratory is for an antenna range facility in the amount of $150,000.

The urgent need for an antenna pattern range facility arises from the rapid growth of the Laboratory and the consequent encroachment on the existing antenna ranges by the construction of new buildings. The construction of a new antenna range facility is absolutely mandatory to continued research in the field of microwave propagation and extreme range communication systems. The facility will provide for the maximum number of transmitters originating from the main tower which can be operated simultaneously on a noninterfering basis. This provides optimum use of the only land that is available for antenna pattern measurement work.

G. NASA HUNTSVILLE FACILITY, HUNTSVILLE, ALA.

At the NASA Huntsville facility, NASA is requesting $26,750,000 for fiscal year 1961.

The first item of this facility is in the amount of $10,800,000 for the Saturn static test facility.

The construction and instrumentation of a tower is required to permit the captive testing of space vehicles in the general class of the first stage of the Saturn vehicle. The project includes all site improvements, utilities, support buildings, and equipment required to make the project fully usable, except for equipment that must be tailormade to suit individual vehicles. The tower itself will consist of a heavy steel structure capable of carrying all vertical loads, both static and dynamic; and a light structure which will take horizontal loads from engine gimballing or from winds, which will support service and work platforms, and which will also carry a gantry crane with its system of tracks. Leading from the tower will be a shallow, concrete-lined trench which will drain the deflector cooling water to a holding pond, which, in turn, will discharge into the Huntsville Spring Creek. Immediately adjacent to the tower will be a two-story concrete building for terminating instrumentation and control cables and for housing special power generators and power switch panels. A cable tunnel will lead from the termination building to a new instrumentation and control blockhouse, which will also be connected to the existing blockhouse and instrumentation system through a bank of conduits. In the new blockhouse will be all control equipment, and consoles needed for the proposed tower and half the recorders needed for testing the Saturn first stage at the new tower with the remainder of the recording being down in the existing blockhouse. Space will be available to add additional instrumentation in the future.

Site work in the project will consist of access roads and railroads; general grading, hardstands, and area drainage; utilities including powerlines, potable water mains, sanitary sewerlines and septic tanks; and a high-pressure industrial water system. A reservoir and pumps for supplying deflector cooling and firefighting water will be provided. Supporting facilities will include a small maintenance shop building; fuel and liquid oxygen storage tanks and piping systems; and high-pressure nitrogen and air storage bottles and piping networks.

The next item provides the sum of $4,400,000 for the construction of a central laboratory and office facility.

This project provides for the construction of a combined laboratory and office building to house personnel of the aeroballistics and research projects laboratories plus staff personnel of the NASA Huntsville facility. The proposed multistory building will provide a gross area of 205,000 square feet and a net area of approximately 144,000 square feet. In addition to the laboratory and office areas, the facility will house a cafeteria, library, small auditorium, conference rooms, equipment rooms for specialized computing equipment, and heating and air-conditioning equipment.

The aeroballistics laboratory performs research and development in the fields of theoretical aerodynamics, flight mechanics and vibration, flutter, and guidance theory to provide a basis for the optimum design of space vehicles and the optimization of trajectory and orbit calculations. In addition, the laboratory conducts analytical investing action of test flights, compiles and analyzes meteorological data for application to vehicle design, and carries on applied supporting research in the fields of aeroballistics and related sciences.

The research projects laboratory coordinates and supervises supporting research programs, provides scientific coordination for various special research projects, and conducts independent research in thermal design, nuclear power problems, and space physics. The missile firing laboratory has the responsibility for all NASA Huntsville facility firings at Cape Canaveral. The office of the director of the missile firing laboratory and his staff are located at Huntsville. The office of the director of the NASA Huntsville facility and supporting personnel provide supervison, and technical and administrative support to the 10 laboratories of ABMA development operations division which will comprise the NASA Huntsville facility.

Under this section of the bill, NASA is requesting $600,000 for a dynamic test facility.

The cost of large, multistage vehicles for space missions is so great that all feasible means of assuring success must be taken. In the field of preflight testing with all stages in place, and with and without full cargoes of propellants or simulated propellants on board the required testing cannot now be done anywhere in the United States due to a lack of suitable facilities. The facility proposed in this project will provide the required test capabilities.

The project provides for the construction of a facility at which the large, multistage Saturn vehicles may be assembled and subjected to various mechanical, structural, and operational tests. The facility will allow the checkout of mechanical mating features; the determination of the natural frequency of the missile, both on the launcher arms and under simulated flight conditions; the temperature effects caused by liquid oxygen or nitrogen when held for various lengths of time; and the effect of simulated flight vibrations on the various stages of the missile.

The facility will consist of two foundations capable of carrying the launcher arms and vehicle at the full flight weight. A steel superstructure will provide lateral support for the vehicle and working platforms at any point on the vehicle. The superstructure will also serve as a pedestal to support a stiff-leg derrick to be used for handling and placing the various stages. Structural members will be included to support the missile by long cables, allowing freedom in all directions, except the vertical, for vibrational studies. One of the foundations will be used for tests requiring numerous work platforms and will provide maximum support for the missile, with the other being used when minimum fixed enclosures are required. Access for personnel to upper platforms will be by stairs and an elevator.

Means will be incorporated in the project for carrying spilled propellants to remote holding ponds to minimize fire hazards. Power, water, and other utilities will be provided as needed, as well as a road, hardstands, and other site improvements. On-stand housing and conduit for instrumentation and control and for connections to the existing systems are a part of this project. Actual recording of test data will be accomplished with equipment available in an existing blockhouse.

The next item is for $650,000 for the construction of a pressure test cell.

There is no pressure test cell available at the NASA Huntsville facility to accommodate the test requirements for the present Saturn program. The proposed facility is necessary to provide a safe and completely blastproof area to perform mechanical, functional, and

pressure testing of the Saturn booster assembly. The booster and its components will be tested in the cell for failure in strength, function, leakage, and timing. The pressure testing of the Saturn boosters cannot be accomplished within existing facilities without endangering the building structure and its occupants.

NASA is requesting $2,500,000 for the construction of an extension to the assembly building at this facility.

Existing assembly facilities were not planned or designed for the development of vehicles approximating the diameters and lengths of the Saturn and future space vehicles. Space and facilities for the development and fabrication of Saturn components is being provided by minor modifications to existing shops and by the shifting of equipment between those shops. However, the need for adequate floor space for assembly and for vehicle alinement, cannot be met without the construction of additional space. The Saturn production schedule will require space for the assembly of several first stage clustered boosters simultaneously.

In addition to providing the necessary floor space for final assembly the proposed addition will provide dust free, humidity controlled cleaning areas; quality control high pressure test facilities including required office space and facilities for other inspection work; and space for subassembly including vehicle wiring and engine buildup.

The next item is a request for $1,137,000 for an addition to the engineering building of the Structures and Mechanics Laboratory.

The mission of the Structures and Mechanics Laboratory is to conduct research and development activities in the fields of structures, mechanics, propulsion, chemistry, and materials as related to all types of space programs. Some of the key elements in the mission include—

Feasibility and design studies, and analytical investigations in the preparation of technical proposals for future spaceflight systems.

Analytical and experimental research, development, and design of structural components and complete airframes of satellites and space vehicles.

Research and development in the fields of propulsion and mechanics as related to space vehicles, including—

(*a*) Design of propulsion systems, propellent feed systems, cooling systems, mechanical assemblies, and components.

(*b*) Methods and systems for protection of the space vehicle system from aerodynamic heating.

(*c*) Integration of propulsion units into space vehicle systems.

Research and development activities in the field of chemistry and materials as applied to the planning, design, manufacture, storage, and operation of space vehicles.

Research and development in the layout and design integration of space vehicles, including:

(*a*) Development of preliminary layouts of space vehicles.

(*b*) Coordination of design activity and integration of design requirements of structures, aerodynamics, guidance and control, and launching and handling equipment.

(*c*) Analysis of weight, moment of inertia, product of inertia, center of gravity, and stability axes.

(*d*) Review, standardization, and approval of all drawings and specifications required for complete documentation and release of final drawing assemblies.

To accomplish this mission, the technical personnel of the laboratory must perform with the utmost efficiency. They must be adequately housed and must be closely integrated. The design and analysis personnel of the laboratory are now located in four buildings. Three of the buildings are more than one-half mile from the laboratory complex of buildings. This presents a number of problems relating to proper coordination of design effort.

The main engineering building of the laboratory now provides 32,000 usable square feet of floor space. There are 602 personnel in this building and 3 outlying buildings who must be brought into the laboratory complex to function efficiently. There is not adequate room in the existing building to accommodate this number of people. Based on the maximum utilization of usable floor area the total floor space required is approximately 71,000 square feet. This project will provide an additional 39,000 square feet of net usable area. Upon completion of the proposed addition, the staff of the structures and mechanics laboratory will have available an average of less than 120 square feet per person which is considered minimal for the types of personnel to be housed.

NASA is also requesting $1,948,000 for the completion of the guidance and control building.

Until recently the mission of the existing guidance and control building was related primarily to military weapons systems with major emphasis on the reliability of surface-to-surface vehicles. With missions now being shifted to pure research and development oriented to payloads, satellites, lunar probes and space vehicles, additional research criteria and requirements have been created. While all existing facilities will be utilized, additional technical capability for investigation, research, and development on problems peculiar to objects being subjected to space travel must be provided. These specialized facilities are required, not only for economy in avoiding trial and error research, but to assure the successful completion of the programs assigned to the NASA Huntsville facility.

The sum of $215,000 is also being requested for an addition to the fabrication laboratory.

The existing fabrication laboratory is overcrowded to the extent that all activities within the building are adversely affected. The existing facilities are entirely inadequate for management and engineering operations. A portion of the entrance lobby has been enclosed, and is now occupied as an engineering office. The engineering staff is working in cramped quarters, that is not conducive to effective creative results. Units of branches are housed in buildings at considerable distance from the present building. This results in adverse working conditions, with resulting difficult and inefficient functioning of liaison and coordination activities.

Construction of the addition proposed in this project is essential to relieve the present overcrowding, and to increase the operating efficiency of the laboratory. The Saturn development program has increased the general engineering and planning workload in this laboratory and as the program progresses the requirement for the proposed addition becomes more acute.

The final item at the Huntsville facility is a request for the construction and instrumentation of additional facilities for the systems analysis and reliability laboratory. It is planned to accomplish this by

adding a 200-foot extension to the existing checkout building. A gross area of 110,000 square feet will thus be provided. NASA is requesting $4,500,000 for this project.

The systems analysis and reliability laboratory will perform a complete checkout of the Saturn booster, including components and subassemblies both before and after static testing of the booster in the test stand. In addition, the checkout of the upper stages and the alinement of the complete system will be performed. By measuring and evaluating performance results and by making corrections where indicated, this function will provide a reliable system and will minimize the possibility of malfunctioning during static test or during actual firing.

An elapsed time of 12 weeks each will be required for prestatic and final checkout. In addition, an estimated 3 weeks will be necessary for preparation of the checkout station to accomplish changes to ground and measuring equipment. The capability of the existing facility is not more than two Saturn vehicles per year, with a dummy or simplified single upper stage. The proposed facility will provide a checkout capability of four Saturns per year including presently planned upper stages. Since the present schedule indicates requirements exceeding existing capability early in calendar year 1962 and since the total estimated construction time of the proposed facility is approximately 26 months, fiscal year 1961 funding will be required.

The committee expressed considerable interest in the transfer of Development Operations Division of the Army Ballistic Missile Agency to NASA. Accordingly, the Commander of the Army Ballistic Missile Agency at Huntsville, Ala., was called as a witness so that the committee could receive his views on the proposed transfer of facilities, and more particularly to obtain a comparison of costs which would have been incurred by the Army had it retained the Development Operations Division.

The major program assigned to the Development Operations Division is Project Saturn, the cluster of liquid rocket engines to produce a launch vehicle with one and a half million pounds of thrust. The majority of the "Construction and equipment" at the NASA Huntsville facility is in support of Project Saturn.

The commander, Army Ballistic Missile Agency, Huntsville, Ala., testified that the Army had submitted four plans for the Saturn project. These were submitted to the Advanced Research Projects Agency of the Department of Defense. Total "Construction and equipment" estimates in these plans were for $20.5 million, $8.9 million, $35.2 million, and $46.5 million.

The Army testimony revealed that the facilities concerned with the Saturn project at Huntsville, Ala., were reviewed by specific item and that with the exception of those which had been introduced by reason of change in technical direction of the space program, i.e., the change from a liquid oxygen-kerosene type upper stage to a liquid hydrogen-oxygen upper stage, all of these facilities were contemplated in the programs previously submitted by the Army.

The Army testimony showed that there have been some modifications when compared with the NASA budgetary requests. For example, NASA is asking for an administrative and central laboratory building, while the Army had previously, in the military construction program, placed a requirement for an aeroballistics laboratory.

NASA's plan differs in that it would expand the Army's planned laboratory so as to include additional office space.

The committee concluded that, considering the total request for "Construction and equipment" at the Huntsville facility, there is an excess of about $1 million over that which the Army would have requested if the Development Operations Division had remained under the Department of the Army. The committee has been shown that the Army's planned requirements prior to the proposed transfer of the Development Operations Division to NASA, and based on an accelerated Saturn program, were $25,889,000 for fiscal year 1961. This compares to the total of $26,750,000 being requested by NASA for the Huntsville facility in the bill.

H. ATLANTIC MISSILE RANGE, CAPE CANAVERAL, FLA.

A total of $27,750,000 will be required for this facility.

The first item under this subsection is for the completion of the Saturn launching complex for which $2,250,000 is being requested.

This project includes funds for the construction required to complete the Saturn vertical launch facility No. 34 and for the procurement and installation of collateral equipment. The Saturn facility, originally funded in the fiscal years 1959 and 1960 by the Department of Defense, is presently under construction. The facility will meet the minimum requirements for the research and development phase of the Saturn program. It will provide the capability to launch a a 1½-million-pound-thrust unit with its upper stages and will service vehicles up to 208 feet in total height. The complex will include a staging building, separately funded, to provide assembly area for the handling and mating of upper stages; minimum office space for upper-stage contractor personnel; a minimum storage area for upper-stage spares and components; and hurricane protection for the booster.

The funds requested in this project will provide for blockhouse equipment and minimum instrumentation for tracking, measuring, and telemetering flight tests; the procurement and final installation of blockhouse checkout equipment; the procurement and installation of collateral equipment required to complete the construction of the Saturn staging building, and necessary design and engineering services.

The next item at the Atlantic Missile Range is for the construction of a safety escape mechanism for the Saturn launching complex currently under construction. The sum of $300,000 is being requested for this purpose.

The height of the Saturn service tower (approximately as high as a 30-story building) and the increased working areas in comparison with all other structures in use, creates a critical personnel safety condition should fire break out with a fueled vehicle on the pad. Upward of 30 persons would have to be evacuated from the five upper-service levels, with the base of the tower probably a fire area. This would preclude the use of the service elevators.

The next item is a request for $2,500,000 for a hydrogen system.

Large quantities of liquid hydrogen will be required for Saturn upper stages. Because of its low boiling point and high flammability, special handling and storage techniques are necessary. Tank trucks will transport liquid hydrogen to the launch site from a generating plant 160 miles distant. The need for a closed-cycle loading system

dictates the requirement for storage and transfer facilities at the launching complex currently under construction. Explosion-proof wiring, vacuum insulation of the storage tanks, and remote control of the fueling operation from the blockhouse are required.

Service tower modifications will also be required including the installation of explosion-proof wiring and hydrogen venting capabilities. These features are not included in the structure currently under construction.

NASA is also requesting a sum of $21 million for a new Saturn launching complex.

The importance to the Nation of the Saturn program and the urgency of attaining desired goals have led to an alteration of certain concepts of operation at the launch site. In particular, recent specific guidelines concerning missions and schedules have permitted establishment of more firm requirements; and recently acquired information concerning blast effects of vehicles which explode during launch, has had considerable impact upon earlier concepts.

In brief, blast studies have established that the booster fuel load of 750,000 pounds could be considered equivalent to 10 percent of this weight in TNT, and that damage to the pad and associated facilities from an explosion of this magnitude would require approximately 1 year to repair. This finding obviously indicates the need for a second pad to insure maintaining schedules with a higher firing rate than 1 per year. A second consideration was to determine the minimum distance between pads to prevent damage to one missile from another which explodes on an adjacent pad. The study determined this distance to be approximately 4,000 feet. The time for checkout of complex Saturn vehicles will require that two missiles be worked on at the same time to meet firing schedules. Hence the second finding outdates the previous practice of providing common facilities for two pads; distances between pads will exceed tolerable runs for measuring leads and propellant lines. It is therefore apparent that a second, completely independent backup launch complex is necessary to support the planned Saturn development schedule.

The new Saturn launching complex will consist of the following:

Blockhouse.—The blockhouse will be a concrete igloo-type structure for the protection of personnel and instrumentation during test firings. The dome will be constructed of reinforced concrete 5 feet thick covered with 7 feet of fill dirt and an additional 4 inches of concrete to provide protection against extremely high blast pressures. Visual observation will be provided by two periscopes, protruding from the top of the dome.

Launch service structure.—The service structure will provide a means of erecting the missile on the launch pedestal in stages. It contains platforms for servicing and checking out the stages prior to launch. The service structure will be approximately the height of a 30-story building. It will be retractable to a rear parking area during firings. The bridge cranes will lift and position any of the stages of the Saturn vehicle. In the lower two floors of the structure, enclosed space will be provided for instrumentation and checkout of the missile.

Umbilical tower.—The umbilical tower will carry fuel lines and power to the missile during checkout and prelaunch phases. Shortly before launching, the fuel and power lines will be disconnected and the umbilical arms swung out of the way of the vehicle's path.

Pad and area development.—This item includes clearing and preparing the area for facilities installation; the construction of concrete work in the pad area, including the launch pad and pedestal, subpad rooms to house special instrumentation, revetments for the protection of propellant storage facilities, and concrete roads within the complex; and extending base utilities such as water, electrical power, and communications to the pad area.

Fuel, liquid oxygen, and high-pressure gas facilities.—Permanent storage and pumping facilities are required to provide fuel and liquid oxygen for the Saturn booster. Liquid oxygen storage capacity of 1,200,000 pounds will be provided by a 41-foot-diameter spherical tank. A smaller 13,000-gallon tank will be used for topping. The fuel storage facility will contain two 28,000-gallon fuel tanks. High-pressure gas will be used in pressurizing the tanks.

Liquid hydrogen facility.—The quantities of liquid hydrogen needed for Saturn upper stages will require a permanent storage and transfer system for proper handling.

Ground-support equipment.—This item will provide for long lead-time capital items of electrical, mechanical, and electronic equipment for vehicle checkout, handling, and launch control.

NASA is also requesting the sum of $1,400,000 for the construction of a staging building. It will provide office and laboratory spaces for upper-stage contractors, storage area for spares, and components, and hurricane protection for all stages, including the booster. It will contain complete checkout equipment for subassemblies, as well as for individual stages. It is planned to locate the staging building in an industrial area convenient to the unloading facility.

The final item at the Atlantic Missile Range is a request for $300,000 to be used for constructing an addition to the engineering and laboratory building.

The combined demand for laboratory, hangar, and engineering space available to the NASA Huntsville facility's missile firing laboratory at Cape Canaveral are already overtaxing available space. The increased workload associated with the Juno II and Mercury programs is further aggravating this situation. By the time the full impact of the Saturn program is assimilated, additional space will be essential if the exacting standards of operation teamwork and hardware preparation so necessary to successful launching operations are to be maintained.

For lack of specialized engineering space existing personnel are being temporarily housed in laboratory and hangar space and in trailers. This arrangement impairs efficiency and undermines operational control since personnel whose efforts must be closely integrated are spread over a considerable area. Furthermore, the imperative need for additional space to store, inspect, and set up the increasing volume of vehicle components, and the checkout and handling equipment associated with these advanced programs, most particularly Saturn, requires either the complete evacuation of these personnel or the construction of additional laboratory and hangar space. The proposed provision of additional engineering and administrative space is decidedly the cheaper solution and will enable an efficiently organized operation.

I. VARIOUS LOCATIONS: TRACKING FACILITIES

This project covers improvements to be made to existing tracking facilities by the addition of basic tracking, data acquisition, communications, and computing capability essential to the accomplishment of new and more complex machines. The sum of $27,750,000 is being requested for this purpose. Major objectives of the 1961 program include:

(*a*) Construction of special meteorological data acquisition equipment and improved tracking equipment;

(*b*) Continued improvements and modifications to the Minitrack stations;

(*c*) Establishment of new portable optical tracking equipment;

(*d*) Establishment of new initial trajectory tracking equipment for deep space vehicles;

(*e*) Establishment of flexible receiving capability at new deep space stations for various frequencies;

(*f*) Improvement of facilities and data handling capability at deep space stations;

(*g*) Completion of instrumentation and construction of Project Mercury tracking stations.

A more detailed discussion of the proposed improvements follows:

Facilities for satellite electronic and optical tracking (*Minitrack net*).—At the beginning of the fiscal year 1961 there will be 14 Minitrack electronic satellite stations at the following locations: Blossom Point, Md.; San Diego, Calif.; Fort Myers, Fla.; Antigua Island, West Indies; Quito, Ecuador; Lima, Peru; Antofagasta, Chile; Santiago, Chile; Woomera, Australia; Esselen Park, South Africa; Newfoundland; Fairbanks, Alaska; East Grand Forks, Minn.; and England. The station in England will not be operational until the last quarter of 1960. These stations will aid in the tracking of satellites in high inclination orbits and of polar oribiting satellites and will have been adapted to the new tracking frequency of 136–137 megacycles by the end of the fiscal year 1960. Improvements are required in automatic read-out equipment to expedite data collection and to permit the tracking of a greater number of satellites.

As more satellites are launched and remain in orbit, automatic data-read-out equipment will be needed for the Minitrack stations to permit more rapid data collection and to permit the simultaneous tracking of the greater number of satellites in orbit. Data acquisition antennas will be procured for five stations for receiving greater quantities of data. New data recording and conversion units will be procured for telemetry purposes. Improvements will also be made in the telemetry receivers to accommodate the transmissions of data from new and more complex satellite payloads. Command transmitters will be modified and updated to meet the requirements of new satellites.

Meteorological satellites to be launched in the fiscal year 1961 will incorporate instruments for transmitting considerable more complex information than is generated by most other types of satellites. This additional complexity is comparable to the difference between transmissions of information of a few words at a time and transmissions of whole sentences or paragraphs of information at a time. Technically, the acquisition of complex information from satellites, such as the cloud cover television pictures which will be

transmitted from meteorological satellites, requires wide-bandwidth receiving systems on the ground.

At present, use is being made of non-NASA facilities at Deal, N.J., and Kaena Point, Hawaii, on a reimbursable basis. Although these stations have certain capabilities (high-gain antennas) for meteorological satellites, they were not designed for this use and are available to the meteorological program on a time-sharing basis only. While these stations will serve the needs of the meteorological program during early exploratory tests, it is necessary that NASA develop, on a full-time basis, data acquisition and display devices and techniques which will serve as prototypes when turned over to an operating agency. The equipment to serve this purpose will consist of a high-gain antenna with supporting wide-band receivers, recorders, and data display devices. This equipment will be originally located at Blossom Point, Md., one of the Minitrack sites. Adequate land is available and it is readily accessible to NASA and Weather Bureau scientists who are carrying out the meteorological program. As the program progresses, this equipment will be redeployed to other Minitrack sites if expansion of world coverage is found necessary. Concurrently, this equipment can be utilized in the planned installation of a more precise tracking system which will be inherently more accurate than the present Minitrack system. A more accurate tracking technique is needed for future measurements in scientific programs.

The existing 12 Baker-Nunn optical stations, which are permanent tracking camera installations installed and operated by the Smithsonian Astrophysical Observatory, are located as follows: Hobe Sound, Fla , Curaçao, Netherlands West Indies; Arequipa, Peru; Villa Dolores, Argentina; Olifantsfontein, South Africa; Cadiz, Spain; Shiraz, Iran; Naini-Tal, India; Woomera, Australia; Mitaka, Japan; Haleakala, Hawaii; White Sands, N. Mex. It is contemplated that additional optical sites consisting of mobile nontracking-type cameras will be needed for geodetic satellites. These cameras will be used to provide the highly accurate data needed for determining the relative location of various land masses with the aid of satellites. Photographing the satellite in relation to known star positions can give accuracies of a few seconds of arc. The cameras will be moved periodically to new sites where new measurements are to be made to acquire the necessary map data. It is contemplated that these stations will have electronic ranging capability, command capability, and timing telemetry capability.

Facilities for deep space stations (deep space net).—The tracking and reception of telemetry data from space probes require the provision of special, highly sensitive receiving systems located at several points on the earth's surface. These stations also provide a potential means for wide-bandwidth data reception. Each station will ultimately consist of two separate 85-foot parabolic antennas, one for transmitting and one for receiving signals. Associated with each is the supporting electromechanical equipment for controlling the antenna and the electronic receiving equipment and transmitting equipment.

The minimum requirement in connection with deep space vehicles is for three tracking stations spaced about 120° apart on the earth's surface. These stations must be in locations where there is little or no electrical disturbances from other activities to interfere with the faint signals received from space vehicles. The JPL facility at Gold-

stone (Camp Irwin), Calif., is the only currently operational deep space station. It is expected that a second station in Woomera, Australia, will be operational during the fiscal year 1960. A third station, in South Africa, is scheduled to be completed during the fiscal year 1961. NASA will continue to make use of the Jodrell Bank 250-foot antenna station in England on a cooperating basis. Substantial portions of the receiver equipment for 960 megacycles were purchased for Australia and South Africa in the fiscal year 1960.

The three stations have programed an operational capability for reception at only a single frequency (960 megacycles). It is necessary to increase this minimal receiving capability to several other frequencies (136 megacycles, 183.6 megacycles, 378 megacycles, 225–260 megacycles) in order to meet the requirements of NASA lunar and satellite programs and for special requirements.

The stations will also require improved data handling equipment to provide a capability for processing large quantities of tracking and telemetry data automatically. This will improve the accuracy, reliability, and capacity of the network. Such capability will also permit more rapid relay of data between the stations in the network. These improvements will facilitate the use of these stations for handling lunar probes, communication satellites, meteorological satellites, highly elliptical scientific satellites, and for certain other special applications.

Except for some technical facilities programed for Woomera, the other stations in the deep space network have no permanent technical, utility, or support facilities. Technical and utility facilities such as permanent control buildings, roads, air conditioning, water, sewerage, antenna feed servicing tower, and fuel storage are required to insure reliable operation. Since there are virtually no backup-type facilities available, efforts must be made to insure continuous operation over extended periods of time despite climatic condition or utility variations In like manner, the operational staff will require permanent housing, mess, and administration facilities. For illustration, the lunar hard landing mission planned for 1961 would require each station staff to operate almost continuously for approximately 1 month.

Lastly, a facility is required to track deep space vehicles very precisely during the first portion of flight close to the earth, but beyond the launching range instrumentation, in order to provide the data necessary to point initially the 85-foot dishes. This facility will possess high tracking rates (six times those of the 85-foot dish) and precision ranging equipment necessary to establish a semidefinitive orbit in a short time period. The location of such a facility is dictated by the trajectory employed since the powered flight is interrupted and a period of coasting allowed. During the coast period the vehicle will generally leave the area covered by the range instrumentation. Therefore, when the final portion of powered flight is initiated, more tracking data must be obtained to ascertain the new trajectory. This initial trajectory tracking station will be co-located with the South African station but installed in a manner permitting relocation if new types of trajectories are later selected. Since the station tracks the payload signal, the majority of the equipment is designed for the 960-megacycle band. Funds will be used for the procurement and installation of antennas, servos, feeds, transmitter and ranging equipment. It is expected that advanced projects in the future will require additional facilities of this type.

Facilities and equipment for support of manned space flight (Mercury net).—Proper execution of the manned satellite program requires the installation of various tracking radars, acquisition equipment, telemetry equipment, communications equipment, and many associated items. A belt of approximately 16 stations encircling the earth is being established to insure means for safe injection into orbit, midcourse tracking and communication, and precision determination of reentry and impact point. Great emphasis must be placed on assuring recovery of the vehicle. Therefore, a high order or reliability is necessary. Backup equipments and systems are employed to increase reliability.

The work to be done under this project includes completion of station construction tasks, particularly affecting the ship stations and Australian and African stations.

Additional electronic tracking equipment and services remaining to be procured consists of modifications on S-band radar equipment for the U.S. mainland; a seaborne radar tracking equipment together with stabilization equipment for installation aboard a ship in the southern California area in the event of such a requirement; and radar accessory and modification equipment, requirements for which cannot be fully determined prior to early demonstration tests.

Additional requirements for data processing and handling equipment includes, computer and communications equipment for data handling; extended and improved ground communications to obtain high reliability, especially in the United States to Bermuda links where initial orbit conditions are most critical; additional communications items for the vehicle-to-earth link; and telemetry and radar data processing and displays which will be augmented, based on demonstration and tests of early prototypes now being purchased.

During this period a considerable demonstration and checkout program will be undertaken including system drills, development of special test equipment, and simulated flight programs to confirm the adequacy of the Mercury network.

Provisions of the Bill Which Permit Variations

Section 2 of the bill permits the Administrator of the National Aeronautics and Space Administration to vary upward by 5 percent the amounts prescribed for "Construction and equipment" in subparagraphs (1) through (9) of subsection 1(b), provided that the total cost of all work authorized by such subparagraphs does not exceed the total amount authorized in the subsection. It has become more or less standard practice to give the executive departments and agencies permission to vary authorizations of this type, so long as the total authorization is not exceeded. In presenting justifications to Congress, the departments can only estimate the costs of construction and equipment, based on the best information available at the time the justification is made. This provision merely gives flexibility to vary individual "Construction and equipment" items as much as 5 percent upward, within the total amount authorized by subsection 1(b).

Section 3 of the bill provides that any amount, not to exceed $5 million, of the funds appropriated for construction and equipment may be used to construct, expand, or modify laboratories or other installations, if found by the Administrator to be necessary because of program changes or scientific or engineering developments, and if the

Administrator determines that deferral until the next authorization act would be inconsistent with the interests of the Nation in aeronautical and space activities. This section also provides that, if he makes this determination, the Administrator shall notify the Committee on Science and Astronautics and the Senate Committee on Aeronautical and Space Sciences of the expected cost. No funds may be used under this provision if authorization for the same purpose has been previously denied by the Congress. This provision of the bill is considered necessary so that the Administrator can exploit scientific breakthroughs or protect the Government in the event of program changes. Without this authority, if such unforeseen changes should occur when Congress was not in session, the Administrator would be unable to meet the emergency until Congress reconvened.

The provisions contained in sections 2 and 3 of the bill, and described above, were included in the NASA authorization and appropriation acts for fiscal year 1960.

Scientific consultations

Section 205 of the National Aeronautics and Space Act of 1958 authorizes NASA to engage in a program of international cooperation. Experience in carrying out such a program over the past year has shown that small expenses are involved for which no budgetary pro vision has been made. Similar expenses arise in scientific consultations within the United States. In addition, NASA may incur other expenses which are unusual and unforeseen in a budgetary sense, such as unexpected kinds of liability. Section 1(e) of the bill therefore provides that appropriations other than "Construction and equipment" may be used, up to a limit of $20,000, for scientific consultation and for emergency or extraordinary expenses. Funds for such purposes are now provided to the Department of Defense, the Atomic Energy Commission, and the armed services.

Cost and Budget Data

The bill will authorize appropriations for fiscal year 1961 in the amount of $915 million.

Committee Recommendation

A quorum being present the committee favorably reported the bill with but one dissenting vote, which is explained in Minority Views made a part of this report.

Department Recommendations

This is a National Aeronautics and Space Administration legislative item, approved by the Bureau of the Budget, as is indicated by the following letter:

National Aeronautics and Space Administration,
Office of the Administrator,
Washington, D.C., February 4, 1960.

Hon. Sam Rayburn,
The Speaker of the House of Representatives,
Washington, D.C.

Dear Mr. Speaker: The National Aeronautics and Space Administration respectfully submits for your consideration a revised draft of proposed bill to authorize appropriations to the National

Aeronautics and Space Administration for salaries and expenses, research and development, construction and equipment, and for other purposes.

The original draft of the proposed legislation was forwarded with my letter of January 18, 1960. The revised draft reflects the recent decision of the President to seek additional fiscal year 1961 funds to give added impetus and greater assurance of early success to our large launch vehicle program.

The NASA has been authorized by the Bureau of the Budget to submit this revised draft of proposed legislation to the Congress. It is respectfully requested that it be introduced in the 86th Congress.

Sincerely,

T. KEITH GLENNAN, *Administrator.*

CHANGES IN EXISTING LAW

In compliance with clause 3 of rule XIII of the Rules of the House of Representatives, there is herewith printed in parallel columns the test of the provision of existing law which would be amended and the corresponding section of the bill:

EXISTING LAW	THE BILL
National Aeronautics and Space Act of 1958, as Amended	* * * * *
SEC. 203. (b)(2) * * * to appoint and fix the compensation of such officers and employees as may be necessary to carry out such functions. Such officers and employees shall be appointed in accordance with the civil-service laws and their compensation fixed in accordance with the Classification Act of 1949, except that (A) to the extent the Administrator deems such action necessary to the discharge of his responsibilities, he may appoint and fix the compensation (up to a limit of $19,000 a year, or up to a limit of $21,000 a year for a maximum of ten positions) of not more than two hundred and sixty of the scientific, engineering, and administrative personnel of the Administration without regard to such laws, and	SEC. 4. That paragraph 203(b)(2) of the National Aeronautics and Space Act of 1958, as amended (42 U.S.C. 2473(b)(2)), is amended by striking out "ten" and inserting in lieu thereof "thirteen," and by striking out "two hundred and sixty" and inserting in lieu thereof "two hundred and ninety."

MINORITY VIEWS

I have long felt that the strengthening of America's general education system deserves an even higher priority than the money authorized or appropriated for either our national defense or space programs.

It does little good to purchase military hardware today or put a man in space tomorrow if we do not at the same time train the brains to improve our hardware and technology in the future. Therefore, I believe that education constitutes the very foundation of our progress in the space effort and national defense.

My opposition to this authorization, and all similar authorizations and appropriations, does not stem from opposition to the value of the projects contained, and I do not wish my vote to be so interpreted. I have no fear that this authorization, and the appropriation to support it, will be defeated. I will be happy when it is approved overwhelmingly. But in this troubled world, I am concerned with the perspective with which we view and approach issues and priorities. I happen to feel that the need for education is so fundamental, and so serious, that it deserves the top priority in the Nation.

This feeling has been deepened and strengthened by my service on this committee. Time and again witnesses have testified that for our Nation to progress in the space and defense efforts we must build up additional basic research, and that our supply of basic research is rapidly becoming exhausted as we draw on it. These same witnesses testify that the most important foundation for basic research is certainly education.

If we are to move forward in the space effort, of course we are going to need people trained in the natural sciences. In other fields, we are also going to need social scientists who can point the way for mankind to reduce human poverty and suffering, to secure disarmament and better international understanding—and ultimately to maintain a lasting peace. And as automation produces more and more leisure time, we shall need more people trained in the humanities as well. Perhaps more training in the humanities would help raise the moral tone of society also, because it could certainly stand some improvement.

What does all this have to do with an important authorization for the National Aeronautics and Space Administration? Simply that I hope through my negative vote to dramatize the fact that aid to our educational system is more important today, and will prove to be more important in the 1970's and the years to come, than what we vote today for space or defense. Of course, we need both education and the urgent current expenditures, and my vote is simply intended to emphasize the relative importance of education.

Therefore, until an adequate Federal aid to education bill is passed I will vote in committee and on the floor against space and defense authorizations and appropriations.

KEN HECHLER,
Member of Congress.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
2d Session } { No. 1334

AMENDING FURTHER CERTAIN PROVISIONS OF DISTRICT OF COLUMBIA TAX LAWS RELATING TO OVERPAYMENTS AND REFUNDS OF TAXES ERRONEOUSLY COLLECTED

MARCH 3, 1960.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. MCMILLAN, from the Committee on the District of Columbia, submitted the following

REPORT

[To accompany H.R. 10000]

The Committee on the District of Columbia, to whom was referred the bill (H.R. 10000) to amend further certain provisions of the District of Columbia tax laws relating to overpayments and refunds of taxes erroneously collected, having considered the same, report favorably thereon with an amendment and recommend that the bill as amended do pass.

The amendment is as follows:

On page 3, following line 3, insert the following language:

> by the District of Columbia Income and Franchise Tax Act of 1947, as amended;

The purpose of this legislation is to extend the period for making refunds of District of Columbia inheritance taxes from 2 to 3 years and thereby to bring such period into line with the period of 3 years allowed for refunds of Federal estate taxes.

The law relating to the period for the making of refunds of District of Columbia inheritance and estate taxes provides that where there has been an overpayment of any tax, the amount of such overpayment shall be refunded to the taxpayer, but that no such refund shall be allowed after 2 years from the date the tax is paid unless before the expiration of such period a claim therefor is filed by the taxpayer.

The Federal law allows a period of 3 years from the time of the filing of a Federal estate tax return within which to file claims for refund of such taxes. The Federal law provides that Federal estate taxes shall be assessed within 3 years after the return was filed. As a result of the 3-year period allowed by Federal law, it sometimes

happens that a Federal estate tax return will not be audited and the tax finally determined until more than 2 years after the District of Columbia inheritance and estate taxes have been paid. If on audit of the Federal estate tax return the net taxable estate is reduced and a refund allowed, it usually follows that a corresponding adjustment in the District of Columbia returns will result in a refund of District of Columbia tax being due to the taxpayer. Under existing District of Columbia law, the refund must be made within 2 years from the time the tax was paid. This sometimes results in a serious injustice where the audit of the Federal return is not completed until more than 2 years after the District of Columbia taxes were paid. The purpose of the proposed legislation is to prevent such injustices.

CHANGES IN EXISTING LAW

In compliance with paragraph 3 of rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill, as introduced, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new matter is printed in italic, existing law in which no change is proposed is shown in roman):

(66 STAT. 546) D.C. CODE 47–2413

SEC. 14. (a) Where there has been an overpayment of any tax, the amount of such overpayment shall be refunded to the taxpayer. No such refund *of taxes other than inheritance and estate taxes* shall be allowed after two years from the date the tax is paid unless before the expiration of such period a claim therefor is filed by the taxpayer. The amount of refund *of taxes other than inheritance and estate taxes* shall not exceed the portion of the tax paid during the two years immediately preceding the filing of the claim, or if no claim is filed, then during the two years immediately preceding the allowance of the refund. *No such refund of inheritance and estate taxes shall be allowed after three years from the date the tax is paid unless before the expiration of such period a claim therefor is filed by the taxpayer. The amount of refund of any such inheritance and estate taxes shall not exceed the portion of the tax paid during the three years immediately preceding the filing of the claim, or if no claim is filed, then during the three years immediately preceding the allowance of the refund.* Every claim for refund must be in writing, under oath, must state the specific grounds upon which the claim is founded and must be filed with the Assessor. If the Assessor disallows all or any part of the claim for refund, he shall send to the taxpayer by registered *or certified* mail a notice of such disallowance. Within ninety days after the mailing of the notice of disallowance, if the claim is acted upon within six months after the filing thereof, or within ninety days after the termination of such six months' period, if the claim is not acted upon within such period, the taxpayer may appeal to the Board, in the same manner and to the same extent as set forth in sections 3 and 4 of this title: *Provided*, That this subsection shall not apply to the taxes imposed by title II, District of Columbia Revenue Act of 1939, as amended; [by the District of Columbia Income and Franchise Tax Act of 1947, as amended;] or by titles I and II, District of Columbia Revenue Act of 1949, refunds of which are otherwise provided for by law; and that it shall not apply to the real-estate tax.

"(b) In any proceeding under this title the Board of Tax Appeals for the District of Columbia shall have jurisdiction to determine whether there has been any overpayment of tax and to order that such overpayment be credited or refunded to the taxpayer: *Provided*, That a timely refund claim has been filed. Where a notice of assessment is mailed to the taxpayer on or before the last day on which a timely claim for refund could be filed, an appeal filed within ninety days after the mailing of such notice asserting an overpayment shall, for the purposes of this subsection, be deemed to be a timely claim for refund.

"(c) The remedies provided to the taxpayer under this title shall not be deemed to take away from the taxpayer any remedy which he might have under any other provision of law, but no suit for the recovery of an overpayment of any tax shall be instituted in any court if the taxpayer has elected to file an appeal with respect to such overpayment with the Board of Tax Appeals for the District of Columbia under this title.

"(d) Any other provision of law to the contrary notwithstanding, if it shall be determined by the Assessor, the Board of Tax Appeals for the District of Columbia, or any court having jurisdiction over the subject matter that there has been an overpayment of any tax, whether as a deficiency or otherwise, interest shall be allowed and paid upon such overpayment of tax at the rate of 4 per centum per annum from the date such overpayment was paid until the date of refund: *Provided*, That with respect to that part of any overpayment which was not assessed and paid as a deficiency or as additional tax such interest shall be allowed and paid only from the date of filing a claim for refund, a petition to the Board, or a complaint with a court of competent jurisdiction, as the case might be.

"(e) For the purposes of this section, any interest or penalties paid by the taxpayer in connection with an overpayment of tax shall be deemed to be a part of such overpayment of tax."

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
2d Session } { No. 1335

FACILITATING THE ACQUISITION OF REAL PROPERTY UNDER THE DISTRICT OF COLUMBIA ALLEY DWELLING ACT

MARCH 3, 1960.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. MCMILLAN, from the Committee on the District of Columbia, submitted the following

REPORT

[To accompany S. 1159)]

The Committee on the District of Columbia to whom was referred the bill (S. 1159) to facilitate the acquisition of real property under the District of Columbia Alley Dwelling Act, having considered the same, report favorably thereon without amendment and recommend that the bill S. 1159 do pass.

The purpose of this bill is to repeal subsection (d) of section 3 of the District of Columbia Alley Dwelling Act, which requires that when the National Capital Housing Authority acquires real property in any square by purchase the total amount paid shall not exceed 30 percent over and above the current assessed value of all property or properties acquired in such square.

The Authority must acquire real property in the District of Columbia to carry out its statutory responsibilities of providing decent, safe, and sanitary housing for families of low income in the District, and in so doing it has experienced a longstanding handicap in performing its duties because of the limitation in existing law on the prices the Authority can pay for real property, except by condemnation proceedings.

The result of this limitation is that all acquisitions by the Authority are by condemnation proceedings, instituted by the Department of Justice in the U.S. District Court for the District of Columbia. In most instances, this is a more expensive and time-consuming operation than a direct purchase of the required property on the basis of agreements with property owners. This is especially true since the current assessed value of many properties does not exceed 50 percent of market value.

Section 2 of the bill amends subsection (a) of section 5 of the District of Columbia Alley Dwelling Act, as amended (sec. 5–107, D.C. Code, 1951 ed.), so as to require an itemization of all properties purchased during each fiscal year by the National Capital Housing Authority, setting forth the assessed value of such properties together with the purchase price thereof.

The enactment of this measure would result in more efficient and economical administration of the land acquisition activities of the Authority without removing adequate controls with respect thereto, and at the same time would relieve the Department of Justice of additional work with its incidental costs.

The bill was requested by and has the approval of the National Capital Housing Authority and the Board of Commissioners of the District of Columbia. The Commissioners have also been advised by the Bureau of the Budget that there is no objection on the part of that office to this bill.

Enactment of this legislation will involve no additional expenditure by the District of Columbia.

CHANGES IN EXISTING LAW

In compliance with paragraph 3 of rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill, as introduced, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new matter is printed in italic, existing law in which no change is proposed is shown in roman):

(48 STAT.; 52 STAT. 1187)

DISTRICT OF COLUMBIA CODE, SECTION 5–105

SEC. 3. (a) The President is hereby authorized, in his discretion, to make immediately available to the Authority for its lawful uses and as needed, from the allocation made from the appropriation to carry out the purposes of the National Industrial Recovery Act, contained in the Fourth Deficiency Act, fiscal year 1933, now carried under the title, "National Industrial Recovery, Federal Emergency Administration of Public Works, Housing, 1933–1935," symbol 03/5666, not to exceed $500,000 of any amount thereof dedicated for low-cost housing and slum-clearance projects in the District of Columbia, to be set aside in the treasury and be known as "Conversion of inhabited alleys fund" (hereinafter referred to as the "fund").

(b) The Authority is hereby authorized and empowered to borrow such moneys from individuals or private corporations as may be secured by the property and assets acquired under the provisions of this Act, and such moneys, together with all receipts from sales, leases, or other sources, shall be deposited in the fund and shall be available for the purposes of this Act. The Authority is hereby authorized and empowered to accept gifts of money from private sources; to borrow from the treasury of the United States not to exceed $1,000,000 in the fiscal year ending June 30, 1939, and a like sum in each of the four succeeding fiscal years, upon such terms and conditions as the President may deem advisable, and appropriations for such purpose are hereby authorized out of the general fund of the treasury: *Provided,* That the Authority shall be obligated for the

payment of interest at the going federal rate as defined in the United States Housing Act of 1937 (U.S.C., title 42, ch. 8).

(c) The fund shall be available annually in such amount as may be specified in the annual appropriation Acts.

[(d) The total amount paid for property or properties acquired, except by condemnation, in any square shall not exceed 30 per centum over and above the current assessed value of all the property or properties acquired, except by condemnation, in such square to carry out the provisions of this Act.]

(e) In carrying out the provisions of this Act, the Authority is hereby authorized and empowered (1) to procure services or make any purchase without regard to the provisions of section 41, title 5, United States Code, provided the aggregate amount involved is not more than $100, (2) to purchase books of reference, directories, and periodicals that are necessary in connection with its work, and (3) to secure architectural and engineering services on specific projects, without regard to the civil service laws and the Classification Act of 1923, as amended (U.S.C., title 5, ch. 13): *Provided*, That this authorization shall not apply to the employment of architects and engineers by the Authority on a permanent basis.

* * * * * * *

SEC. 5. (a) The Authority shall make a report to the President, which he shall transmit to Congress at the beginning of each regular session, giving a full and detailed account of all operations under the provisions of this Act for the preceding fiscal year[.], *including an itemization of all properties purchased during such fiscal year, setting forth the assessed value of such properties, together with the purchase price therefor.*

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
2d Session } { No. 1336

REMISSION OF INDEBTEDNESS OF ENLISTED MEMBERS OF THE NAVY UPON DISCHARGE

MARCH 3, 1960.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. LANE, from the Committee on the Judiciary, submitted the following

REPORT

[To accompany H.R. 471]

The Committee on the Judiciary, to whom was referred the bill (H.R. 471) to amend chapter 561 of title 10, United States Code, to provide that the Secretary of the Navy shall have the same authority to remit indebtedness of enlisted members upon discharge as the Secretaries of the Army and the Air Force have, having considered the same, report favorably thereon with amendments and recommend that the bill do pass.

The amendments are as follows:

Page 1, line 7, insert a period after the word "discharge".

Page 2, line 1, insert the words" of the Navy" after the word "Secretary".

PURPOSE

The purpose of the proposed legislation, as modified by the recommendation of the committee, is to add a new section 6161 to the Navy subtitle of title 10 of the United States Code to grant the Secretary of the Navy similar authority to that now being exercised by the Secretary of the Air Force and the Secretary of the Army as to the remission or cancellation of enlisted member's indebtedness to the United States remaining unpaid before, or at the time of, that member's honorable discharge.

STATEMENT

The new section proposed in H.R. 471 contains the same language now contained in section 4837(d) of title 10, United States Code, relating to the Secretary of the Army and in section 9837(d) of title 10,

United States Code, relating to the Secretary of the Air Force. In each instance subsection (d) provides:

> (d) If he considers it in the best interest of the United States, the Secretary may have remitted or cancelled any part of an enlisted member's indebtedness to the United States or any of its instrumentalities remaining unpaid before, or at the time of, that member's honorable discharge.

It is therefore clear that this bill would make it possible for each of the Secretaries of the military departments to exercise the same authority regarding the remission of indebtedness of enlisted members of the armed services. This committee is of the opinion that the new section provided for in H.R. 471 should be added to title 10 in order to provide for uniform practice as between the Army, Navy, and Air Force as to the remission or cancellation of enlisted member's indebtedness.

The provisions of law now codified as subsections (d) of sections 4837 and 9837 originated as a proviso to an act of May 22, 1928 (ch. 676, 45 Stat. 699) which granted the Secretary of War authority to cancel or remit indebtedness of an enlisted man upon his honorable discharge. The act of June 26, 1934 (ch. 751, 48 Stat. 1222) reenacted the previous provisions in substance, and provided that the remission or cancellation could be made upon honorable discharge "or prior thereto when in his opinion the interests of the Government are best served by such action." In 1947 "the Secretary of the Army" was substituted for "the Secretary of War" in connection with these provisions (act of July 26, 1947, ch. 343, 61 Stat. 501, sec. 205). The creation of the Air Force as a separate branch of the Armed Forces at that time resulted in equivalent authority being extended to the Secretary of the Air Force in accordance with the provisions of section 305(a) of the National Security Act of 1947 (61 Stat. 508). When title 10 was enacted into positive law as a codified title of the United States Code, these provisions of law relating to the remission or cancellation of indebtedness were included in the two sections 4837 and 9837 discussed above. The new section proposed in H.R. 471 is a logical step in the light of this history. The committee has concluded that the amendment of title 10 by the addition of this section is required in the interest of uniform application of the laws relating to the Army, Navy, and Air Force.

Speaking on behalf of the Department of Defense, the Department of the Navy in its report to this committee on H.R. 471 stated that it favors the enactment of the bill. The Navy recommends that the words "of the Navy" be inserted following the word "Secretary" in line 1 of page 2 of the bill. This will make it clear that the authority is conferred on the Secretary of the Navy. In view of the favorable recommendation of the Department of Defense and the Navy and the considerations outlined above, this committee recommends that the bill, amended in accordance with the recommendation of the Navy, be favorably considered.

DEPARTMENT OF THE NAVY,
OFFICE OF THE SECRETARY,
Washington, D.C., January 8, 1960.

Hon. EMANUEL CELLER,
Chairman, Committee on the Judiciary,
House of Representatives, Washington, D.C.

MY DEAR MR. CHAIRMAN: Reference is made to your letter to the Secretary of the Navy dated February 10, 1959, requesting comment on H.R. 471, a bill to amend chapter 561 of title 10, United States Code, to provide that the Secretary of the Navy shall have the same authority to remit indebtedness of enlisted members upon discharge as the Secretaries of the Army and the Air Force have.

Section 4837(d) and section 9837(d) of title 10, United States Code, relating to the Secretary of the Army and the Secretary of the Air Force, respectively, provide as follows:

"(d) If he considers it in the best interest of the United States, the Secretary may have remitted or cancelled any part of an enlisted member's indebtedness to the United States or any of its instrumentalities remaining unpaid before, or at the time of, that member's honorable discharge."

There is no such provision of law relating to the Secretary of the Navy. H.R. 471 would insert a new section 6161 in the Navy subtitle of title 10, United States Code, identical in language to the above-quoted provision, thus providing the Secretary of the Navy with the same discretionary authority to remit or cancel enlisted members' indebtedness as the Secretaries of the other military departments now have. In the interest of clarity, it is recommended that the words "of the Navy" be inserted after the word "Secretary" in line 1 on page 2 of the bill.

The Department of the Navy, on behalf of the Department of Defense, favors enactment of H.R. 471.

This report has been coordinated within the Department of Defense in accordance with procedures prescribed by the Secretary of Defense.

The Department of the Navy has been advised by the Bureau of the Budget that there is no objection to the submission of this report on H.R. 471 to the Congress.

Sincerely yours,

JOHN S. MCCAIN, Jr.,
Rear Admiral, U.S. Navy,
Chief of Legislative Affairs
(For the Secretary of the Navy).

CHANGES IN EXISTING LAW

In compliance with paragraph 2 of clause 3 of rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill are shown as follows (new matter is printed in italic and existing law in which no change is proposed is shown in roman):

TITLE 10.—ARMED FORCES

* * * * * * *

Chapter 561.—MISCELLANEOUS RIGHTS AND BENEFITS

Sec.

* * * * * * *

6161. Remission of indebtedness of enlisted members upon discharge.

* * * * * * *

§ 6161. Remission of indebtedness of enlisted members upon discharge

If he considers it in the best interest of the United States, the Secretary may have remitted or canceled any part of an enlisted member's indebtedness to the United States or any of its instrumentalities remaining unpaid before, or at the time of, that member's honorable discharge.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
2d Session } { No. 1337

HOOD COUNTY, TEX.

MARCH 3, 1960.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. TOLL, from the Committee on the Judiciary, submitted the following

REPORT

[To accompany H.R. 5726]

The Committee on the Judiciary, to whom was referred the bill (H.R. 5726) for the relief of Hood County, Tex., having considered the same, report favorably thereon with an amendment and recommend that the bill, as amended, do pass.

The amendment is as follows:

Page 2, lines 4 and 5, strike "in excess of 10 per centum thereof".

PURPOSE

The purpose of the proposed legislation is to pay to the commissioners court of Hood County, Tex., $10,279, in full settlement of all claims for damage resulting from flood during the period April 19–27, 1957, declared by the President, pursuant to the terms of the Federal Disaster Act (Public Law 875, 81st Cong.), on April 29, 1957, to be a major disaster.

STATEMENT

Under the Federal Disaster Act the Government renders financial and other assistance to States and local governments in cases where damage from disaster is so great as to overwhelm the resources of the State and local governments affected.

The Office of Civil and Defense Mobilization (then the Federal Civil Defense Administration) acted on the President's declaration and surveyed the damage suffered by Hood County and estimated Hood County to be eligible for projects in the amount of $10,279.

By reason of the action of the county judge the application for financial assistance called for by the county commissioners was not filed within the required time, namely, within 60 days from June 29,

1957. Instead of receiving the application for the funds determined in the amount aforesaid the Office of Civil and Defense Mobilization received, on September 25, 1957, a memorandum requesting that the file on Hood County be closed.

On Discovering that the application was not filed within the prescribed time by the county judge, the county commissioners requested that the matter be reopened and learned that relief can only be afforded by congressional action.

The population of Hood County is 5,000. The amount stated in the bill, $10,279, is based upon an actual estimate made by the Government of the damages in the county.

There appears to be no question as to the merit of the claim or about the amount of damages. It does not appear that the delay in filing the claim, to the detriment of the people of Hood County, occasioned any disadvantage to the Government inasmuch as the facts were fully investigated and the amount claimed in this bill accurately and fully determined by the Government. This is not such a stale claim as to work a harm to the Government or an unfair advantage to the claimant. Therefore your committee recommends favorable consideration be given this bill.

EXECUTIVE OFFICE OF THE PRESIDENT,
OFFICE OF CIVIL AND DEFENSE MOBILIZATION,
OFFICE OF THE DIRECTOR,
Washington, D.C., May 20, 1959.

Hon. EMANUEL CELLER,
Chairman, Committee on the Judiciary,
House of Representatives,
Washington, D.C.

DEAR MR. CHAIRMAN: This is in reply to your request for a report on H.R. 5726. The bill would authorize payment by the Federal Government to the commissioners court of Hood County, Tex. in the amount of $10,279 for damages resulting from floods during the period of April 19–27, 1957.

For the above period, the President on April 29, 1957, declared the damage occurring in the State of Texas to be a major disaster pursuant to the terms of the Federal Disaster Act (Public Law 875, 81st Cong.; 42 U.S.C. 1855 et seq.), as amended. The Office of Civil and Defense Mobilization directs disaster relief activities and administers the act for the President under Reorganization Plan No. 1 of 1958 and Executive Orders 10773, 10737, and 10427.

Under this act, the Federal Government renders financial and other assistance to States and local governments when the damage from a disaster is of such magnitude as to overwhelm the resources of the State and local governments affected. The preamble of this act states its purpose is to provide an orderly and continuing means of supplementary assistance by the Federal Government to local governments overwhelmed by major disasters.

Upon the declaration by the President of the major disaster on April 29, 1957, the OCDM (then the Federal Civil Defense Administration) provided damage survey teams for the assistance of local governments. A survey of Hood County indicated an estimate of eligibility for projects in the county in the amount of $10,279 and this information was made available to the State of Texas and to

Hood County. The terms of the agreement between the State of Texas and the OCDM required all applications for financial assistance under this major disaster be submitted by the State and its local governments within 60 days from the execution of the agreement on April 29, 1957. On May 4, 1957, and June 29, 1957, this agreement was amended to include the damage and suffering brought about by heavy rains and Hurricane Audrey. (Other amendments to the agreement, not here pertinent, were entered into.) The time periods for filing applications under this agreement were extended to accommodate these amendments.

As can readily be seen from the foregoing, the Hood County Commissioners had ample opportunity to make a timely filing under the terms of the Federal-State Disaster Agreement and in accordance with the provisions of Public Law 875. However, on September 25, 1957, the Office of Civil and Defense Mobilization regional office in Denton, Tex. received a memorandum from the State of Texas requesting that the file on Hood County be closed, since the State was in receipt of advice from the county that an application would not be filed by Hood County in this disaster.

On February 24, 1959, the State of Texas requested, on behalf of Hood County, that the project be reopened and Hood County be granted assistance under the terms of the act and regulations thereunder.

This request to reopen could not be granted. Executive Order 10737 and OCDM regulations require that all work undertaken in the rendering of disaster assistance be completed within 1 year from the date of the disaster. Public Law 875 authorizes financial assistance only for emergency work in the temporary repair of essential public facilities damaged or destroyed in a disaster, and like measures. Long-range rehabilitation or reconstruction does not fall within the purview of the act.

Public Law 875 was enacted by the Congress to provide an orderly and continuing means of Federal assistance to supplement the efforts of State and local governments in major disasters. One of the major reasons for the Congress approving the act was to eliminate the necessity of it considering bills for the relief of geographic areas each time a disaster struck.

It is essential that some degree of administrative finality be available in administering the act to avoid stale claims and to permit determinations in the light of circumstances then existing. For these reasons, we are apposed to the enactment of H.R. 5726.

The Bureau of the Budget advises that it has no objection to the submission of this report.

Sincerely,

LEO. A. HOEGH.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
2d Session } { No. 1338

FORD CITY, PA.

MARCH 3, 1960.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. HENDERSON, from the Committee on Judiciary, submitted the following

REPORT

[To accompany H.R. 5850]

The Committee on the Judiciary, to whom was referred the bill (H.R. 5850) for the relief of the borough of Ford City, Pa., having considered the same, report favorably thereon with amendment and recommend that the bill do pass.

The amendment is as follows:

Strike out all after the enacting clause and insert:

That notwithstanding laches or any statute of limitations, jurisdiction is hereby conferred on the United States District Court for the Western District of Pennsylvania, to hear, determine, and render judgment on the claim of the borough of Ford City, Pennsylvania, for damage to its sewer system allegedly due to the construction by the Department of the Army of a lock and dam designated as "Lock and Dam No. 6," on the Allegheny River.

SEC. 2. Proceedings shall be instituted any time within ninety days after the date of the enactment of this Act.

PURPOSE

The purpose of the proposed legislation, as amended, is to confer jurisdiction, notwithstanding laches or any statute of limitations, on the U.S. District Court for the Western District of Pennsylvania to hear, determine, and render judgment on the claim of the borough of Ford City, Pa., for damage to its sewer system allegedly due to the construction by the Department of the Army of a lock and dam designated as "lock and dam No. 6," on the Allegheny River.

STATEMENT

The borough of Ford City, Pa., is located on the Allegheny River, a navigable river at that point, and its gravity flow sewer system was

constructed by it in 1897, with its outlets allegedly about 2 feet above the ordinary high water mark of the river.

In 1928 the Corps of Engineers, in the interests of navigation, constructed the above-described lock and dam at a point about 4 miles downstream from Ford City.

The claimant contends that the construction of the lock and dam raised the level of the river above the ordinary high water mark causing inundation of about one-third of its sewer system, resulting in backflow, undermining sewer foundations, damage to streets, and requiring constant pumping operations.

Before construction of the dam, the claimant assets that the normal pool level of the river at Ford City was 759 feet; the ordinary high water mark was about 764 feet; and the elevation of the sewer outlets, 766 feet.

After the construction it was asserted that the dam caused a rise of 10 feet in the normal pool level of the river, raising it to 769 feet, 3 feet higher than the sewer outlet, and the ordinary high water mark was raised to about 774 feet.

The Department of the Army contends that its operations did not cause a rise in the ordinary high water mark, and, if it did, recovery would be barred by reason of the statute of limitations.

The claimant asserts that it first became apparent in 1931 that its sewer system had been severely damaged due to the activities of the Corps of Engineers. The form of government in the borough is a town council of six members who are elected for 4 years, and they change from time to time. The town records are incomplete but it appears that it was advised, erroneously, that the town had no right of action on which to base a claim. As a result, the statute of limitations, the prescriptive period, will act as laches to bar a claim, and, while the general welfare had been served, it was at a great cost to Ford City.

The damage, asserted by the claimant to be in the amount of $412,250, is computed as of May 1959, and it is the replacement cost of the damaged sewers. This amount is considerably higher than what the replacement cost would have been in 1928 when the construction was completed or in 1931 when the alleged cause of damage was first discovered. The committee was not informed as to what the costs would have been at those times.

The committee had before it conflicting views as to whether or not the construction of the lock and dam did in fact raise the high water mark so as to inundate the claimant's sewer system as it alleges. It also had before it the question of damages, the extent and the amount thereof. Neither of the foregoing could be evaluated and fixed without extensive, costly, and time-consuming hearing and perusal of the evidence. The subject matter, the several contentions and the refutations are all matters properly within the domain of judicial proceedings. Inasmuch as the facts contended are determinable notwithstanding the passage of the time and the Government would not be seriously handicapped in its defense, the committee has determined that the people of the borough of Ford City should not be deprived of a probable remedy by reason of error on the part of its officials.

In weighing the general welfare gained by the public as against the alleged great cost to the claimant, the committee is of the opinion

that this case merits waiving any statute of limitations or laches which may prevent a full and complete judicial consideration on the merits in a forum convenient to all parties. The committee therefore recommends that the amended bill be considered favorably.

DEPARTMENT OF THE ARMY,
Washington, D.C., July 21, 1959.

Hon. EMANUEL CELLER,
Chairman, Committee on the Judiciary,
House of Representatives.

DEAR MR. CHAIRMAN: Reference is made to your request to the Secretary of the Army for the views of the Department of the Army with respect to H.R. 5850, 86th Congress, a bill for the relief of the borough of Ford City, Pa.

The bill would provide for the payment to the borough of Ford City the sum of $412,250 in full settlement of its claims against the United States for damage to its sewage system resulting from raising the level of the Allegheny River by construction of a lock and dam.

The Department of the Army is opposed to the enactment of this bill.

Ford City, Pa., is located on the Allegheny River. It has a gravity flow sanitary and storm sewer system, dumping raw sewage into the river, which was built many years ago by the abutting property owners. The United States through the Corps of Engineers, U.S. Army, constructed a lock and dam on the river some 6 miles downstream from Ford City. It was completed in 1928 and designated "lock and dam No. 6." This structure raised the level of the river, as a result of which portions of the Ford City sewer system which had theretofore been flooded intermittently became permanently inundated.

The level of the pool behind lock and dam No. 6 did not exceed the ordinary high-water mark. At Ford City the Allegheny River is a navigable stream of the United States. It is well settled that under the commerce clause, U.S. Constitution, article I, section 8, clause 3, the United States has authority to improve its navigable waters in the interest of navigation without liability for damages to private property in the bed of the stream; i.e., lying below the ordinary high-water mark (*United States* v. *Chicago, M., St. P. & P.R. Co.*, 312 U.S. 592; *United States* v. *Willow River Power Co.*, 324 U.S. 499). No liability was imposed upon the Government for damage, if any, to the Ford City sewer system by reason of the construction and maintenance of the lock and dam.

The Sanitary Water Board of Pennsylvania has now ordered Ford City to construct a sewage treatment plant. Its engineers advised that a large portion of the street sewers, those under the pool level of the Allegheny River, cannot be incorporated into the new system and must be replaced. It is for the cost of these new sewers that this claim is made.

The construction of the lock and dam did not create the necessity for a sewage treatment plant nor is this Department advised that the order of the sanitary water board was predicated thereon.

Over the years persons and communities have suffered damage through the exercise by the United States of its authority to improve navigation. No reason is apparent why Ford City should be given preference over the many others similarly situated.

For the foregoing reasons the Department of the Army recommends that the bill not be favorably considered.

The cost of this bill, if enacted, will be $412,250.

The Bureau of the Budget has advised that there is no objection to the submission of this report.

Sincerely yours,

WILBER M. BRUCKER, *Secretary of the Army.*

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
2d Session } { No. 1339

ALBERTSON WATER DISTRICT

MARCH 3, 1960.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. LANE, from the Committee on the Judiciary, submitted the following

REPORT

[To accompany H.R. 8868]

The Committee on the Judiciary, to whom was referred the bill (H.R. 8868) for the relief of the Albertson Water District, Nassau County, N.Y., having considered the same, report favorably thereon with an amendment and recommend that the bill, as amended, do pass.

The amendment is as follows:

On page 2, line 4, strike out: "in excess of 10 per centum thereof".

PURPOSE

The purpose of the proposed legislation is to pay the Albertson Water District, Nassau County, N.Y., the sum of $765.97 in full settlement of its claims against the United States for reimbursement under the Federal Civil Defense Act of 1950 of one-half the cost of leasing communications equipment maintained for civil defense purposes in the period beginning July 1, 1956, and ending June 30, 1957.

STATEMENT

The Albertson Water District participated with the Office of Civil and Defense Mobilization in connection with the leasing of a radio communication system. As is noted in the report of the Office of Civil and Defense Mobilization to the committee on the bill, leases of communications equipment maintained for civil defense purposes for use in the event of emergencies are included among the items which can be approved for financial contributions from that Office under the terms of section 201(i) of the Federal Civil Defense Act of 1950. During the fiscal year of 1957, the Albertson Water District expended $1,531.95 for leasing and maintaining communication equipment for

civil defense purposes. In behalf of the Albertson Water District, the State of New York submitted an application for the leasing of this equipment. The evidence submitted to this committee in connection with the bill indicates that the application for reimbursement in the amount of $765.97 was proper, and was filed in time for the Office of Civil and Defense Mobilization to process it under the applicable provisions of law. The report of that Office agrees that the application was submitted, and that the steps taken by the State of New York "otherwise complied with all of our requirements." However the application was misplaced and was not found and approved until after the time had passed during which the reimbursement could be made. The Government report described these circumstances with these words:

> The State of New York, in behalf of the Albertson Water District, Nassau County, submitted an application for the leasing of such equipment and otherwise complied with all of our requirements. The application was misplaced by our region 1 and was not found and approved until after the end of the fiscal year involved in the application. No contribution could then be made for this purpose because the Comptroller General has ruled that retroactive financial contributions to the States are not permissible (B–106964, Jan. 17, 1952).

The foregoing quoted language from the report of the Office of Civil and Defense Mobilization, in the opinion of this committee, demonstrates that the Albertson Water District and the State of New York acting on its behalf made every effort to cooperate with the Federal Government in this program, and did in fact make a timely application for the reimbursement to which the district was entitled. Under these circumstances it is clear that the Albertson Water District is entitled to the relief provided for in H.R. 8868. This is recognized in the report of the Office of Civil and Defense Mobilization which observes that the peculiar circumstance of this case coupled with the fact that there was no fault on the part of the State or the Albertson Water District prompts that Office to recommend enactment of the bill. In view of these facts and the recommendation of that Office, the committee recommends that the bill be considered favorably.

EXECUTIVE OFFICE OF THE PRESIDENT,
OFFICE OF CIVIL AND DEFENSE MOBILIZATION,
OFFICE OF THE DIRECTOR,
Washington, D.C., November 23, 1959.

Hon. EMANUEL CELLER,
Chairman, Committee on the Judiciary,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: This is in reply to your request for a report on H.R. 8868, 86th Congress.

The Office of Civil and Defense Mobilization makes financial contributions to the States for civil defense purposes under the authority contained in section 201(i) of the Federal Civil Defense Act of 1950, as amended. Pursuant to the provisions of this section, the Office of Civil and Defense Mobilization prescribes the criteria upon which this financial assistance is made available to the States and, through the States, to their political subdivisions.

Among the approvable items for which financial contributions are made are leases of communications equipment maintained for civil defense purposes for use in the event of an emergency. The State of New York, in behalf of the Albertson Water District, Nassau County, submitted an application for the leasing of such equipment and otherwise complied with all of our requirements. The application was misplaced by our region 1 and was not found and approved until after the end of the fiscal year involved in the application. No contribution could then be made for this purpose because the Comptroller General has ruled that retroactive financial contributions to the States are not permissible (B–106964, Jan. 17, 1952).

H.R. 8868 would authorize the Secretary of the Treasury to pay to the Albertson Water District the sum of $765.97 which the district would have received under the above-mentioned application.

In view of the peculiar circumstances of this case, and because there was no fault on the part of either the State of New York or the Albertson Water District in this matter, the Office of Civil and Defense Mobilization recommends enactment of H.R. 8868. Our position on this bill, however, cannot be deemed to have any general application.

The Bureau of the Budget advises that it has no objection to the submission of this report.

Sincerely,

LEO A. HOEGH.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
2d Session } { No. 1340

VALIDATION OF CERTAIN PAYMENTS OF ADDITIONAL PAY FOR SEA DUTY MADE TO MEMBERS AND FORMER MEMBERS OF THE U.S. COAST GUARD

MARCH 3, 1960.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. Lane, from the Committee on the Judiciary, submitted the following

REPORT

[To accompany H.R. 9921]

The Committee on the Judiciary, to whom was referred the bill (H.R. 9921) to validate certain payments of additional pay for sea duty made to members and former members of the U.S. Coast Guard, having considered the same, report favorably thereon without amendment and recommend that the bill do pass.

PURPOSE

The purpose of the proposed legislation is to validate payments of additional pay for sea duty made prior to June 30, 1956, to enlisted members of the Coast Guard who served on vessels of less than 125 feet in length. The bill would further permit the refund of any repayments made by any of those men relating to those payments received in the above manner, and relieve the authorized certifying officers from accountability for such payments.

STATEMENT

This bill, H.R. 9921, was introduced in accordance with the recommendations of an executive communication transmitted to the Congress by the Treasury Department.

The payments with which this bill is concerned were made in accordance with a determination made by the Coast Guard that enlisted men serving on 83- and 95-foot patrol boats were entitled to sea-duty pay under applicable law and an Executive order issued on the subject. This order, Executive Order No. 10168, issued under

the provisions of section 206 of the Career Compensation Act of 1949, provided that sea-duty pay for enlisted men of the uniformed services was payable while the men were serving on vessels restricted to service in the inland waters of the United States "but only on days when such vessel is actually operating outside of inland waters for a period of 8 days or more in each case." A Coast Guard Headquarters directive was issued to implement this Executive order, and it stated that Coast Guard 83- and 95-foot patrol boats were considered not to be vessels "restricted to service in the inland waters of the United States unless the primary duties assigned to a particular boat restricted its service to inland waters." In this connection, the 8-day period mentioned in the Executive order was construed as a savings clause applying only in those rare instances where inland-operated craft made an ocean voyage under unusual circumstances. Each district commander was authorized to determine whether the primary duties assigned to these vessels in his district restricted their services to inland waters. As a result of these determinations nearly all such vessels were found eligible for sea-duty pay and such pay was received by the members serving aboard them from January 1, 1955, until April 1, 1956.

In a decision on this subject, the Comptroller General held that Coast Guard patrol boats which are primarily equipped for inland water duty, and which are not regularly at sea at least 5 percent of the time, may not be regarded as unrestricted within the meaning of Executive Order No. 10168 so as to entitle the members to sea-duty pay. The Comptroller General further held that the question of whether vessels which spend more than 5 percent of the time outside inland water boundaries may be regarded as unrestricted is for administrative determination based on each particular vessel and its duties.

The Comptroller General's ruling affected the crews of 82 vessels. In attempting to adjust accounts under the "5 percent" rule referred to above, it was found that it was all but impossible to accurately determine the periods of time that those crews were entitled to credit for sea-duty pay. The memorandum accompanying the Treasury Department's communication noted that the lack of certain administrative records added to the inequity of recovering sea-duty payments from the crewmen involved. It was concluded that because of these difficulties, that only claims supported by documentary evidence from a vessel's log would be considered, and the Secretary of the Treasury so advised the Comptroller General. The Comptroller General reconsidered and reaffirmed his earlier decision that the payments were made erroneously and should be recovered. The Coast Guard then reviewed the 1,875 notices of exception received which involve approximately $100,000. Pay adjustment authorizations and collection letters were transmitted where applicable.

On May 20, 1959, the President promulgated Executive Order No. 10821 which establishes a far broader area of entitlement to sea-duty pay. The new Executive order permits payment of sea-duty pay on the same vessels that the exceptions were originally lodged against. Also the new order does not provide a rule regarding time spent at sea. However, the Comptroller General has ruled that changes under such an order can have no retroactive effect. Therefore the changes will have no effect upon the payments for sea pay in the period from

January 1, 1955, to April 1, 1956, and these are the payments with which H.R. 9921 is concerned.

As is obvious from the facts outlined above and as set forth in more detail in the executive communication and its accompanying memorandum, there is absolutely no fraud or collusion involved in this situation. The officers who made the erroneous payments followed official directives and acted in good faith. The Treasury Department has referred to the fact that numerous cases of hardship exist as a result of this situation. Further the information supplied to this committee indicates that continued efforts to effect collection of the questioned payments of sea-duty pay will be costly, time consuming, inequitable, and of doubtful fruitfulness. In the light of these facts and in consideration of the modification of the basis for sea pay under the subsequent order, this committee has concluded that the relief provided for in H.R. 9921 should be extended to the enlisted men of the Coast Guard and the former enlisted men of that service who are concerned. Accordingly, this committee recommends that the bill be considered favorably.

The executive communication of the Treasury Department is as follows:

OFFICE OF THE SECRETARY OF THE TREASURY,
Washington, January 19, 1960.

THE SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: There is transmitted herewith a draft of a proposed bill, to validate certain payments of additional pay for sea duty made to members and former members of the U.S. Coast Guard.

The purpose of this proposal is to validate the payment of additional pay for sea duty made prior to June 30, 1956, to enlisted members of the Coast Guard who served on Coast Guard vessels less than 125 feet in length. Any such member or former member who has already repaid any amount of this additional pay would be entitled to have refunded to him the amount so repaid. If these payments were made without fraud or collusion, the Comptroller General of the United States would be obliged to relieve the officers who made them from accountability and responsibility. Appropriations available to the U.S. Coast Guard for the pay and allowances of enlisted personnel would be available for payments under the bill.

Executive Order No. 10168 issued under the provisions of section 206 of the Career Compensation Act of 1949 provided among other things that sea-duty pay for enlisted men of the uniformed services was payable while the men were serving on vessels restricted to service in the inland waters of the United States "but only on days when such vessel is actually operating outside of inland waters for a period of 8 days or more in each case." An administrative interpretation of this condition resulted in the payment of sea-duty pay to enlisted men serving on Coast Guard 83- and 95-foot patrol boats from January 1, 1955, until April 1, 1956. The Comptroller General in decision B–124474 took exception to these payments and ordered the erroneously paid money recovered. The complexity of redetermination of eligibility for this sea-duty pay in the case of 82 vessels wherein certain operational facts are not available renders the task extremely expensive, time-consuming, inequitable, and of doubtful fruitfulness. Many members have long been separated from the

service. There are numerous cases of hardship and collection in many cases will be effected only through costly court action. No fraud or collusion is involved; all payments were made and received in good faith. Had these payments been made today under Executive Order No. 10821, which superseded Executive Order No. 10168, the payments would unquestionably have been proper and valid. There are 1,875 overpayments involved, representing approximately $100,000. A similar bill validating payments of sea-duty pay made to enlisted members of the naval service was enacted on July 27, 1956 (Public Law 822, 84th Cong.). An attached memorandum describes in more detail the need for and nature of the proposed bill.

It would be appreciated if you would lay the proposed bill before the House of Representatives. A similar proposed bill has been transmitted to the President of the Senate.

The Department has been advised by the Bureau of the Budget that there is no objection to the submission of this proposed legislation to the Congress.

Very truly yours,

A. GILMORE FLUES,
Acting Secretary of the Treasury.

MEMORANDUM RE PROPOSED BILL TO VALIDATE CERTAIN PAYMENTS OF ADDITIONAL PAY FOR SEA DUTY MADE TO MEMBERS AND FORMER MEMBERS OF THE U.S. COAST GUARD

Pursuant to section 206 of the Career Compensation Act of 1949 (63 Stat. 811), the President issued Executive Order No. 10168 on October 11, 1950, which related to the payment of additional pay for sea duty to enlisted members of the uniformed services. Section 2(d) of this Executive order provided that enlisted members shall be entitled to sea-duty pay for duty performed "while on a vessel restricted to service in the inland waters of the United States * * * but only on days when such vessels actually operating outside of inland waters for a period of 8 days or more in each case." A Coast Guard Headquarters directive (finance and supply memorandum No. 54–54) issued to implement the Executive order, stated that Coast Guard 83- and 95-foot patrol boats were considered not to be vessels "restricted to service in the inland waters of the United States unless the primary duties assigned to a particular boat restricted its service to inland waters." The 8-day period mentioned in the Executive order had been construed as a savings clause applying only in those rare instances where inland-operated craft make an ocean voyage under unusual circumstances. Each district commander was authorized to determine whether the primary duties assigned to these vessels in his district restricted their services to inland waters. As a result of these determinations nearly all such vessels were found eligible for sea-duty pay and such pay was received by the members serving aboard from January 1, 1955, until April 1, 1956.

The Comptroller General in decision B–124474 (36 Comp. Gen. 372) has held that Coast Guard patrol boats which are primarily equipped for inland water duty, and which are not regularly at sea at least 5 percent of the time, may not be regarded as unrestricted within the meaning of Executive Order No. 10168 so as to entitle the members to sea-duty pay, and whether vessels which spend more than 5 percent

of the time outside inland waters boundaries may be regarded as unrestricted is for administrative determination based on each particular vessel and its duties.

The Secretary of the Treasury advised the Comptroller General that from preliminary work incident to trying to find the most equitable and economic procedure for adjusting accounts under the 5-percent rule, the following conclusions were reached:

(1) It will be impossible to accurately determine the periods of time that the crews of all 82 vessels were entitled to credit for sea-duty pay, nor would it be reasonable or equitable to recover these sea-duty payments to members because of the absence of administrative records made at a time when a ship's position during an operational assignment was not significant in relation to entitlement to sea pay.

(2) If the decision is mandatory to adjust the accounts that are susceptible to proper and equitable determination of entitlement to sea-duty pay for the period, the Coast Guard will be faced with the expenditure of hundreds of man-hours on a seemingly fruitless and inequitable task. We point out that there are members who are entitled to sea-duty pay for the period January 1, 1955, through December 31, 1956. It will be equally impossible, in most cases, to determine their entitlement. Therefore, only those claims which are supported by documentary evidence from a vessel's official log will be considered.

On this basis and in the light of concurrence of the Comptroller General in certain proposed changes in Executive Order No. 10168, to authorize payment of sea-duty pay to enlisted members serving on vessels restricted to inland waters, the Secretary asked for a reconsideration of the necessity for recovery of the payments of sea-duty pay made prior to April 1, 1956. The Comptroller General reconsidered and reaffirmed his earlier decision that the payments were made erroneously and should be recovered (38 Comp. Gen. 562).

A review of the 1,875 notices of exception received, involving approximately $100,000, has been made and pay adjustment authorizations and collection letters have been transmitted where applicable. It is not known whether the General Accounting Office will accept the final Coast Guard report upon all vessels involved.

On May 20, 1959, the President promulgated Executive Order No. 10821 which establishes a far broader area of entitlement to sea-duty pay. The new Executive order permits payment of sea-duty pay on the same vessels that the exceptions were originally lodged against. No rule regarding time spent at sea has been provided. The Comptroller General has stated that "when and if Executive Order No. 10168 (the old) is changed as proposed, such changes will have no effect upon the payments here involved, it being settled that regulations may not be amended to increase or decrease retroactively the rights of individuals under prior regulations" (38 Comp. Gen. 564).

To continue efforts to effect collection of the erroneous payments is costly, time consuming, inequitable, and of doubtful fruitfulness. The officers making the erroneous payments followed directives and the members receiving them did so in good faith. No fraud or collusion is involved. Numerous cases of hardship exist. An inequity results in these collections in that the pay of active duty and retired members of the Coast Guard involved may be checked, however, members separated from the service cannot be forced to repay the amounts received without costly civil court action. A similar bill

validating payments of sea-duty pay made erroneously to enlisted members of the naval service who served on the USS *Sequoia* from November 1, 1950, through February 28, 1954, and to those who served on vessels operating on the Great Lakes from November 1, 1950, through October 31, 1953, was enacted on July 27, 1956 (Public Law 822, 84th Cong.).

A BILL To validate certain payments of additional pay for sea duty made to members and former members of the United States Coast Guard

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That all payments of additional pay for sea duty made prior to June 30, 1956, to enlisted members of the United States Coast Guard who served on Coast Guard vessels less than one hundred and twenty-five feet in length are hereby validated. Any such member or former member who has made repayment to the United States of any amount so paid to him as additional pay for sea duty is entitled to have refunded to him the amount repaid.

SEC. 2. The Comptroller General of the United States, or his designee, shall relieve authorized certifying officers of the United States Coast Guard from accountability or responsibility for any payments described in section 1 of this Act, and shall allow credits in the settlement of the accounts of those officers for payments which are found to be free from fraud and collusion.

SEC. 3. Appropriations available to the United States Coast Guard for the pay and allowances of enlisted personnel are available for payments under this Act.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
2d Session } { No. 1341

AMENDING THE FIRE AND CASUALTY ACT REGULATING THE BUSINESS OF FIRE, MARINE, AND CASUALTY INSURANCE IN THE DISTRICT OF COLUMBIA

MARCH 3, 1960.—Referred to the House Calendar and ordered to be printed

Mr. MCMILLAN, from the Committee on the District of Columbia, submitted the following

REPORT

[To accompany H.R. 10183]

The Committee on the District of Columbia, to whom was referred the bill (H.R. 10183) to amend the Fire and Casualty Act regulating the business of fire, marine, and casualty insurance in the District of Columbia, having considered the same, report favorably thereon without amendment and recommend that the bill H.R. 10183 do pass.

Section 20 of the Fire and Casualty Act of October 9, 1940, provides that:

> Upon complying with the provisions of this Act, a foreign or alien company organized as a stock, mutual, or reciprocal company, or as a Lloyd's organization, but not otherwise, may be authorized by certificate of authority to transact in the District the kind or kinds of business which a domestic company similarly organized may be authorized to transact under this Act.

The purpose of this legislation is to permit any company chartered by a special act of the legislature of its State of domicile prior to the effective date of the Fire and Casualty Act as a company without capital stock but doing business exclusively on the stock plan and maintaining at all times a surplus of not less than $300,000 to be considered as a stock company for purposes of the administration of the Fire and Casualty Act.

This legislation has the approval of the Superintendent of Insurance for the District of Columbia as well as the Commissioners of the District of Columbia.

CHANGES IN EXISTING LAW

In compliance with paragraph 3 of rule XIII of the Rules of the House of Representatives, changes in existing law made by the bill, as introduced, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new matter is printed in italic, existing law in which no change is proposed is shown in roman):

(54 STAT. 1073) SECTION 20, D.C. CODE 35–1323

Upon complying with the provisions of this Act, a foreign or alien company organized as a stock, mutual, or reciprocal company, or as a Lloyd's organization, but not otherwise, may be authorized by certificate of authority to transact in the District the kind or kinds of business which a domestic company similarly organized may be authorized to transact under this Act. Such certificate of authority shall be issued as provided under section 2, chapter II of this Act. The issuance of a certificate of authority to a Lloyd's organization shall be subject to the provisions of section 20A of this Act. *Any company chartered by special act of the legislature of its State of domicile prior to the effective date of this Act, as provided in section 48 of this Act, as a company without capital stock but doing business exclusively on the stock plan and maintaining at all times a surplus of not less than $300,000 shall, in the administration of this Act, be considered as a stock company.*

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
2d Session } { No. 1342

NATIONAL TRANSPORTATION WEEK

MARCH 3, 1960.—Referred to the House Calendar and ordered to be printed

Mr. FORRESTER, from the Committee on the Judiciary, submitted the following

REPORT

[To accompany H.J. Res. 602]

The Committee on the Judiciary, to whom was referred the joint resolution (H.J. Res. 602) authorizing the President to proclaim henceforth the week in May of each year in which falls the third Friday of that month as National Transportation Week, having considered the same, report favorably thereon with amendments and recommend that the joint resolution do pass.

The amendments are as follows:

Strike out the whereas clauses.

Page 2, line 4, strike out the word "henceforth".

Page 2, line 5, strike out "each year" and insert in lieu thereof "1960".

Amend the title to read:

> A bill authorizing the President to proclaim the week in May of 1960 in which falls the third Friday of that month as National Transportation Week.

GENERAL STATEMENT

This bill, as reported, would authorize the President to proclaim the week in May of 1960 in which falls the third Friday of that month as National Transportation Week.

The transportation industry in this country has been an enormous influence on the growth of the United States. The United States today has the finest transportation system in the world. It is appropriate, therefore, that we recognize the importance to the United States of the transportation industry by setting aside a week as a tribute to the men and women who move goods and people throughout this country.

EXECUTIVE COMMUNICATION

A report from the Interstate Commerce Commission on House Joint Resolution 294, a predecessor bill, is appended hereto.

INTERSTATE COMMERCE COMMISSION,
Washington, D.C., December 18, 1959.

Hon. EMANUEL CELLER,
Chairman, Committee on the Judiciary,
House of Representatives, Washington, D.C.

DEAR CHAIRMAN CELLER: Your letter of December 10, 1959, addressed to the Chairman of the Commission and requesting its views on a joint resolution (H.J. Res. 294), introduced by Congressman Harris, authorizing the President to proclaim the week in May of each year in which falls the third Friday of that month as National Transportation Week, has been referred to our Committee on Legislation. After consideration by that committee, I am authorized to submit the following comments on its behalf;

House Joint Resolution 294 would request and authorize the President to proclaim the week in May of each year in which falls the third Friday of that month, as National Transportation Week and to invite the people of the United States to observe that period as a tribute to the men and women in the transportation industry.

Public transportation is the very nerve center of commerce, and commerce is one of the most important methods by which the strength and unity of our Nation have grown. House Joint Resolution 294, would publicly recognize the vitality and resourcefulness of the people who have so capably met and comtinue to meet the ever-changing and growing needs of our country. It would provide the means by which a tribute could be paid to the entire transportation industry which, over the years, has had no small task in keeping abreast of all of the changing phases that have marked the development of American enterprise.

If adopted, the proposed joint resolution would serve to bring into proper focus the role of this tremendously important industry as a vital part of our national economy. The proclamation contemplated by this measure would be a forward step toward the promotion of complete understanding, not only among the carriers themselves, but between the carriers, shippers, and the public in general.

We are in complete accord with the spirit and purpose of House Joint Resolution 294 and urge its adoption.

Respectfully submitted.

KENNETH H. TUGGLE, *Chairman,*
ANTHONY ARPAIA,
HOWARD FREAS,
Committee on Legislation.

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86TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
2d Session } RULES COMMITTEE { No. 1343

CONSIDERATION OF H.R. 10777

MARCH 3, 1960.—Referred to the House Calendar and ordered to be printed

Mr. O'NEILL, from the Committee on Rules, submitted the following

REPORT

[To accompany H. Res. 467]

The Committee on Rules, having had under consideration House Resolution 467, reports the same to the House with the recommendation that the resolution do pass.